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Organic Gardening

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CHEMICAL FERTILIZERS AND SUBSTANDARD SOILS AND TASTELESS FOODS

June 23, 1947.

As I remember my boyhood nearly fifty years ago and the delicious vegetables produced on our farm and garden in the virgin soil of southern Indiana Territory, now Oklahoma, and compare those vegetables with the tasteless, stringy things grown now with the aid of commercial fertilizers, it seems as though you may have something in "Organic Gardening."

All the fertilizer we knew of then was a few loads of barnyard manure, and the only parasite we had to fight was an occasional infestation of potato beetles. Now almost every plant one may be lucky enough to get to grow has some insect ready to pounce upon it and devour it as soon as it peeps through the soil. From then on to maturity it is a constant battle with every kind of insect, worm, beetle that flies, crawls, burrows in the soil or is borne on the wind, visible and invisible, and the net result is far inferior to the old-time harvest.

I have ten acres of land just outside of Birmingham, one of which I try to garden partly as a hobby and partly as an aid to reduce grocery expenses. The land has been in cultivation since before the Civil War and for years and years before I bought it, commercial fertilizers had been used on it. Now it will scarcely produce anything except weeds, and they are scrawny without using tons of it.

Bearing out your theory, I noticed where I planted some young trees in the orchard, I gave them a generous application of well-rotted stable manure. In the soil near the trees the

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PHOTO: Upright Yew Hedge 10 years after planting 15-18" size (inset).

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weeds would grow to a height of four to six feet while at a short distance from the little tree the weeds would be from six inches to two feet high.

Excuse this long letter and enter my subscription for I am definitely interested in "ORGANIC GARDENING."

James A. Turner,
Route 9, Box 102,
Birmingham, Alabama.

—o—

LEATHERDUST

July 6, 1947.

I thank you very much for your detailed answer regarding Leatherdust and will be glad to ship to you free of charge a few bags during the course of next week. The material is quite light in weight while dry, about 30 lbs. per standard size grain burlap bag maximum.

I should like to list a few of the observations made since writing to you earlier about Leatherdust. The core of the pile of this dust, where it is blown by fans from the buffing wheels in the tannery, feels quite warm—probably because here the material is packed tighter by its own weight than on the outside of the pile, where it is as fluffy as dust in the bag of a vacuum cleaner.

A few burlap bags filled with leatherdust fell accidentally in the brook running along the yard of the tannery. They were recovered but discarded being soaked and dumped on a cement platform in the yard. I turned some of these bags, that by now are half rotted, and found a colony of healthy looking large red earthworms. Mind you, they seem to thrive on Leatherdust-Burlap, for there is no soil and they cannot very well live on cement flooring!

Yesterday I built a compost pile in a wooden box, measuring about four feet square as well as high with a roll of chicken wire (6") as chimney. As material I used rather strawy wild grass, about three feet tall, that I had cut that very morning, some ground

"An even better book, by and large, than PLOWMAN'S FOLLY."
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A SECOND LOOK

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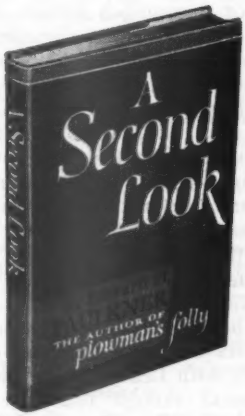
EDWARD H. FAULKNER, who astonished the agricultural world with his revolutionary theories of plowless farming in PLOWMAN'S FOLLY, adds to and re-examines his earlier conclusions in this new book. After extensive experiments of his own, and visits to experiment stations, soil scientists, and farmers in 24 states, he can authoritatively give the lie to the theory of "soil impoverishment" which has led to the indiscriminate use of commercial fertilizer. Faulkner shows that the development of "real soil", through the decay of organic matter that unlocks the minerals required for healthy plant growth, in the long run not only increases productivity and quality, but makes plants so healthy that the need for sprays and insecticides is greatly diminished, if not done away with entirely.



Faulkner not only discusses his theory at length but gives actual case histories of its application which anyone can apply to his own soil problems.

He tells how Southern farmers, using green manure on a sandy soil, produce 50 to 100 bushels of corn where 10 grew before. He describes his own experience in bringing back a patchy lawn to a verdant green. He writes of a victory gardener in Ohio, who, using Faulkner's methods of plowless farming, green manure, and level cultivation throughout the year, greatly improved his entire garden's yield. These are just a few of the hundreds of cases from every part of the country of increased productivity due to "natural" soil enrichment. They all go to prove that Faulkner's methods basically are applicable to any soil problem in any soil area.

Experts praise this book highly

LOUIS BROMFIELD says of this book: "It is a rich book, stimulating and significant of the new, lively and practical interest in agriculture which is growing among industrialists, bankers and laymen of all sorts. It asks for the answer and explanation of many facts known as such by experienced farmers which research has until now failed to provide . . . the book is dedicated to the premise that if sufficient organic material were restored to most American agricultural soil, the need for commercial or 'artificial' fertilizers would be nullified."

RUSSELL LORD says: "He remains, happily, the Number One Needler of a hide-bound, orthodox agriculture in this land."

Farmers and gardeners alike will benefit from reading this revolutionary new book by the precedent-breaking author of PLOWMAN'S FOLLY. You can order your copy through this magazine. Just clip the coupon. Save yourself the costs of expensive fertilizers and insecticides by investing $2.00 in this easy-to-read book.

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limestone and phosphate rock as well as a mixture of dried roots of witchgrass and poor soil as rotting agent. In between all this I sprinkled about 25 lbs. of Leatherdust, primarily between the layers of grass and the old sods. I did not actually layer the leatherdust because I was afraid of its capacity to absorb water and thereby to clog circulation within the pile. I watered each layer with a watering can full of water. Exactly 24 hours after completion of this pile I noticed smoke coming out of the chimney and upon examination found that the stack was heating vehemently—but also that it gave out a rather objectionable odor.

Frankly, I had tried my luck in building compost piles many times, but so far have never been able to make one heat. I was thrilled to see that I could do with leatherdust what I could not accomplish before with horse manure, activators, commercial fertilizer and other mediums. Now, is it compulsory for an active compost pile to smell and act like a volcano?

I have used Leatherdust on field grass stubble and lawn and also made applications in the form of side dressings on corn and potatoes. While I did not burn anything I did not observe positive results, probably because of the little time elapsed.

Please be good enough to let me have the benefit of your experience once you have completed your own experiments with Leatherdust. Please keep in mind though that not all Leatherdust is alike, since it derives from a variety of animals raised under varying conditions and tanned by many different methods, i.e. combinations of chemicals.

Hermann K. Kirschner,
North Beverly, Mass.

(EDITOR'S NOTE—We will experiment with the leather dust.)

—o—

July 23, 1947.

Having spent 9 years of my childhood in Italy gardening with the peas-

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ants, I couldn't help becoming intensely interested in this intelligent revival of organic gardening. The memory comes back vividly of the hay stack and compost pile surrounded by chickens, geese and pigeons. The pleasant pungent taste so strong that ours of today seem only like ghosts in comparison. Is all this natural farm life to return to us to gladden our hearts and redden once more the cheeks of our American children?

It is just a year ago that I became interested in organic gardening and the making of compost. The booklet entitled "Our Friend the Earthworm" interested me so much that I planned an experiment. I made a compost pile of a lot of garbage, some old hay, cow manure and soil. Before I left for the winter, I piled hay about a foot deep over the whole thing to keep in the dampness. I never turned it over because I didn't have either the time or the strength and just hoped that things would turn out alright. I returned in April and found to my great amazement the most perfect black top soil I have ever seen completely filled with earthworms. Then I sent for three chickens and two ducks owned by the children. Within ten minutes they had discovered the compost pile and haven't left it since. We no longer have the bother of these birds in the front flower beds, in the vegetable garden or on the lawn; furthermore, they no longer run to me when I bring them corn. They are so well nourished by the worms in the compost pile that corn has little attraction for them.

Now my next step is to make a much larger compost pile for next year solely for the benefit of a flock of hens and there will be no doubt in my mind that these birds' eggs will be two or three times as nourishing as those from an ordinary hen yard. There should be added profit in this kind of chicken raising. For one thing no chicken wire or pen is needed, as the chickens never stray. Very little grain is needed and I for one would pay quite fancy prices for eating eggs or chickens and I am sure there are many who feel the way

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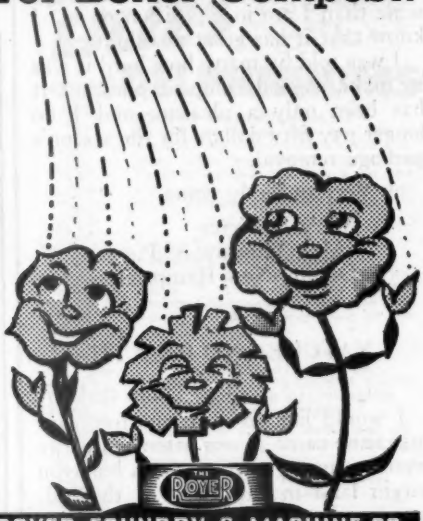

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I do. Incidentally, I never saw a penned up chicken in all of Italy and they never left the barn yard.

I am hoping that people will start this kind of chicken raising on a larger scale than I am in a position to do. I know that it has great possibilities.

I was told by many how hard it was to make a good compost pile, but it has been only a pleasure and I no longer pay fifty dollars for the season's garbage removal.

Very sincerely yours,

Mary B. Pierce,
(Mrs. Winslow S. Pierce, Jr.),
Dublin, New Hampshire.

—o—

NATURE AND HEALTH

June 6, 1947.

I would like to mention that your magazine came to our attention as we were beginning to carve out a home on virgin land in the heart of the redwoods. In this cool, moist climate where the soil with its deep layers of leafmold is undisturbed, one can daily observe the prolific natural growth coming forth in continuous abundance. Thus, without gardening experience but with profound respect for Nature's laws, we could see at once that your organic methods are sound. It has given me great pleasure to extend this valuable information to friends and the benefits derived from your advertisements are inestimable. Through them I have located the many kinds of plants and shrubs we shall enjoy on this place including rare wild flowers such as Trailing Arbutus and Mandrake so dear to my Michigan childhood. Therein also, I found where to obtain healthful foods and the MIRACLE of Sunflower Seeds, the eating of which eliminated within a short time an annoying eye ailment of long standing. Indeed, your publication must intrigue all who have felt the impulse of the advancing New Era and its spirit of service.

Mrs. R. F. Whitmore,
Arcata, California.

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COMPOST AND DISEASE-FREE PLANTS

July 8, 1947.

I have been reading your magazine and I have practised your theory with the best of my ability.

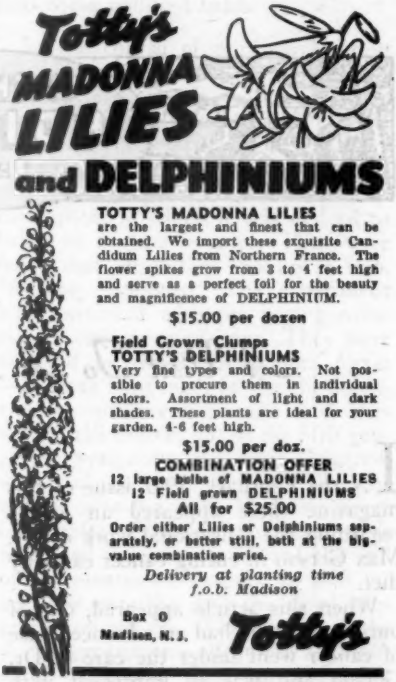
I have been making compost and using it and have been getting good results without using sprays. I am also raising earthworms. I do not plant barley, as is recommended, because I cannot find a place to buy it. I also have been informed that lime will kill earthworms. Is this true? (Perhaps excessive amounts would be dangerous.)

Aside from the above, I have six hybrid rose bushes that are doing exceptionally well this year and the only trouble I have had has been with Japanese beetles. Other insects are not around and I am wondering if it could be an unusual year to be free from insects. For two years I have fed the roses generously with bonemeal in the fall and placed a heavy mulch of compost held down with stones. I also have planted parsley on the border.

I also want to state that my house plants have been free of rust and other discolorations since I have planted grass seed in the pot. Do you think this has any merit?

I only have a small place but I have had a lot of pleasure with the hobby and I am trying to convert other people in my neighborhood to the practise of organic gardening. Thanks for an interesting hobby and healthful results.

Lewis I. Riddell,
2 Green Valley Road,
Wallingford, Pa.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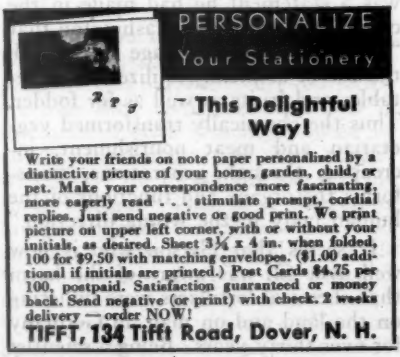
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A Visit To A Famous Physician

IN the February, 1947 issue of this magazine there appeared an article regarding the sensational work of Dr. Max Gerson in curing cancer cases by diet.

When this article appeared, one of our readers who had an advanced case of cancer went under the care of Dr. Gerson and was so impressed with what was going on in that office, that he wrote me a series of enthusiastic letters, urging me to come and talk with Dr. Gerson. In one of them he said that "Dr. Gerson is literally snatching people from the grave." He had many interesting conversations with cured cancer "cases" that were coming back for check-ups. What finally impelled me to visit Dr. Gerson was a statement he had made in the cancer bill hearing at Washington that "the fundamental damage starts with the use of artificial fertilizer for vegetables and fruits as well as for fodder. Thus the chemically transformed vegetarian and meat nourishment, increasing through generations, transforms the organs and functions of the human body in the wrong direction."

It seems that Gerson who is now well over 62, was aware of the harm that chemical fertilizers were inflicting on the land and on man, in Germany for over thirty years. Being a scientist of the highest calibre he actually engaged in experimental work in this field. In 1929-1930, in association with a professor Falk at the Forestry Academy of Hanover Munden, he studied the iodine content of plants. Dr. Gerson discovered that just as a lack of iodine in the human body is a cause of goitre, so it is one of the factors in cancer causation. He discovered that plants that grow quickly have more iodine, and that the parts of a plant that grow the quickest contain the most of this valuable element.

Of eight vegetables they experimented with they found that watermelon and lettuce contained the most iodine; next came radishes, asparagus and broccoli and the poorest group—potatoes and tomatoes. This would indicate the extreme importance of including materials in making compost that contain iodine, such as seaweed, kelp and fish products which originate at the kitchen table. One should carefully save for the compost heap such inedible fish parts.

In another experiment that they performed, said Dr. Gerson, they found that when a chemical fertilizer, potassium chloride, was used, the iodine content of the cells of the plant was diminished, but when horse and cow manure and urine were employed,

the cells were enriched with iodine. There is much evidence in experimental literature to show that the use of artificial fertilizers locks up desirable elements in the soil and unlocks the undesirables, whereas organic matter has the opposite effect. For example, the beneficial trace element, boron—we gave the details in this magazine some time ago, of an experiment which showed that the application of chemical fertilizers made the existing boron unavailable to plants, but that organic matter reversed the process. A lack of boron produces dwarfed alfalfa, brown-flecked turnips, and rusty-stemmed celery. When you use compost, you can then begin to see what you are doing in Nature's own test-tube laboratory in the soil. Legumes will not make root nodules for the bacteria to produce nitrogen unless boron is present. A lack of boron will cause rotting of the core of sugar beets.

Let us take the case of aluminum which is extremely plentiful in many soils, but which is a toxic element if it is in excess. Here, the reverse of the previously described phenomena prevails. The application of chemical fertilizers makes more of the aluminum available, but organic matter locks it up, so that it cannot hurt the plant. Does not this look like a wonderful plan in nature to protect the soil and plants by giving them an organic diet?

When Dr. Gerson was a young man in Germany they used to raise sugar beets the old fashioned way with manure and the beets were of tremendous size. Making sugar out of beets was a big industry in Germany. Soon came the chemists and as the years went by, the size of the beets kept dwindling until not only were they smaller than a fist, but they did not contain sufficient sugar to make it worth while to process them. The sheep used to graze in the old beet fields but as the land became chemicalized they would get hoof diseases and a kind of eczema. At last the farmer couldn't get the sheep to enter these fields. You could beat them to death but they refused to go into these polluted fields.

In the course of our conversation Dr. Gerson mentioned an experiment to illustrate that it will take many generations until the full impact of the use of chemical fertilizers is felt to its fullest extent by the public. Then it will hit and hit hard. He described an experiment in which it was desired to bring on anemia in mice. They were fed a diet absolutely lacking in iron. Nothing happened. The experiment was continued with the next generation of this group of mice. They were also fed an iron-deficient diet. Again—nothing happened. In the third generation, nothing happened and likewise in the fourth, but in the fifth generation symptoms of anemia appeared, while in the sixth the mice became anemic in a big way. Will this occur to people? Chemical fertilizers were first used in quantity toward the end of the nineteenth century so that we are now entering into the third generation of its use. This means, if the mouse experiments effect will be duplicated on man, that our children's grandchildren may be visited by some kind of black plague which may almost wipe out the race. Let us not be too harsh on our children's grandchildren.

There is another scientific procedure today which is in the same class with the situation just described. I refer to artificial insemination of cows. This dangerous practice is being adopted wholesale today all over the country. In our own section, the Lehigh County Dairy Co-operative has an elaborate plant for this purpose. Very few farmers own their own bull. The cow is inseminated with semen produced in an unnatural manner at these plants, which have the blessing of our agricultural colleges. This is a dangerous tampering with the processes of God through Nature. What will be the ultimate biologic effect on the cow and the nutritional quality of her milk? What will be the ultimate effect on bulls born by this abominable method?

Will they become sterile in the fifth or sixth generation? Will they become sterile even before this? Will the milk so produced be milk, in the fifth generation? Don't forget, a cow's generation is much shorter than a man's. We may feel the effect of it in our time. Will the cow become subject to terrible diseases?

Already it is being admitted in the highest scientific circles that the breeding of aristocratic cows, to give huge quantities of milk and butterfat is becoming uneconomic. It has been found that the average productive life of such cows is only seven years. Udder troubles and sterility condemns them to the slaughter-house long before an ordinary scrub-cow would go. Is this scientific, or is it merely the effect of chemicalized food on the farmer, who is gradually turning into a weakling and is counting on a push-button basis of work? This is a matter for thorough investigation by each state.

I have read about and heard many instances of the gradual reduction in physical ability of farmers and people generally. A worker needs the proper food in order to carry on heavy work. An orchardist who visited me a few months ago told me that in their orchards thirty years ago men could handle large barrels containing 3 bushels of apples all day long, and for long hours. Today, you cannot get them to work effectively with more than 1 bushel barrels, and for a shorter workday.

I know it is dangerous to have a bull on every farm. They go on a rampage on occasion and kill and maim, but a country that has the brains to develop an atom bomb, surely could find the solution for such a simple problem, without going haywire altogether.

Dr. Gerson was responsible, in Germany, for developing what are known as sewage farms. He showed the Germans the fallacy of destroying the product of the sewage plants and the folly of dumping human excrement into the oceans. They listened to him. Around each large city were developed big farms to grow vegetables for the city people. Drainage canals were built and the sewage was allowed to weather over the winter. The municipalities built swimming pools and other amusements on these farms, and in season the city folks came out with their children and produced their own fresh vegetables. The demand for canned vegetables was reduced to such a point, says Dr. Gerson, that the Government arranged for the sale of the canning machinery to other countries. About one-half of it found its way to the United States, where the can-opener is one of the most essential household tools.

Dr. Gerson described how the large potash combine started Germany off on a chemical farming era in the early days of this century. In those days the farmers to a great extent used the imported Peruvian Guano (bird droppings). The chemical trust, it seems, secured control of the entire German share of this organic fertilizer, and would not sell any to the German farmer, advertising to them the great value of the German chemical potash. You can guess the rest. Germany had a practical monopoly on potash deposits. At first the American farmer did not take to it but the Germans offered it at give-away prices. As the farmer came to depend on it, the price was gradually raised and it became one of the biggest industries in Germany.

The food that Dr. Gerson's patients eat, are not produced organically, but are purchased in the regular markets. Dr. Gerson feels that he could do much more effective work in curing cancer patients if he could purchase food raised organically. He appeals to farmer readers of *Organic Gardening* Magazine. If you wish to co-operate will you write direct to Dr. Max Gerson, 11 East 74 Street, New York, N. Y.

The Animal As Our Farming Partner

By SIR ALBERT HOWARD

IN Nature animals and plants lead an interlocked existence. The connection could not be closer, more permanent, or more crucial. We can observe this partnership in operation in the forest, in the prairie, in marshes, streams, rivers, lakes, and the ocean.

If we watch what is taking place in our wayside hedges throughout the year, we at once realize the consequences of this plant-animal relationship. The mixed wastes of the two populations fall on the surface of a soil already rich in organic matter and are automatically converted into still more high-quality humus which is then absorbed and used to feed first the soil population and then the vegetation. Every spring the wildings come into leaf, then into flower, and die down in the autumn before the winter rest. There is practically no disease: no crop failures occur: the services of the plant breeder for raising new varieties are not needed: there are no openings either for the veterinarian or for the plant pathologist. Nature's arrangements obviously succeed for they have passed the supreme trial—the test of time.

In the Far East, in particular, farming and gardening have followed the lead given to us by Mother Earth. Great stress has always been laid on the preservation of live stock and on the fullest use of the waste products of the animal. In India, for example, the cow is looked upon as sacred and its preservation is welded into one of the great religions of this continent. In this way the slaughter of the cattle (maintained for work, for milk, and for manure) in times of scarcity has been prevented: the cow-dung essential for the rice nurseries has been safeguarded: the manure needed for such vital crops as vegetables, fruit, sugar-cane, and vine has been provided. The operations of Nature have thus helped in the make-up of the population, of their religion, and their agriculture. Some of the results obtained recall those of our hedgerows. The indigenous varieties of sugar-cane which still bear their Sanskrit names have always been raised with cattle manure and have maintained themselves for at least twenty centuries without any loss of quality, of disease resistance, or of the power of vegetative reproduction. The vines so widely cultivated on the western frontier tell the same story.

A somewhat similar partnership between crops and live stock began to be firmly established in Great Britain when the defects of the manorial farming of the Middle Ages were made good by enclosure and the laying down of the exhausted open arable fields to grass. This was consumed by great flocks of sheep which furnished the wool needed by the looms of Europe. Mixed farming developed: the Norfolk four-course system was devised and adopted all over the island. It was in full and successful operation on our farm in Shropshire in my early years.

Then a change for the worse began. Our growing industries demanded cheaper food for the workers and cheaper raw materials for the factories. These came in an ever-increasing flood from the virgin lands of the New World. The well farmed fields of Great

Britain had to face cheap produce subsidized by the unconscious transfer of the capital of the soils of America to current account. It soon became impossible to farm on the old Norfolk pattern: the place of the animal as our farming partner had reluctantly to be given up in favour first of the machine and the manure bag, then of various types of monoculture in which live stock had little or even no place. Another development was to concentrate on animals at the expense of the crop, the live stock being fed very largely on feeding stuffs imported from overseas. In such ways the balance between the crop and the animal was destroyed: the self-supporting farms of the nineteenth century became a memory.

Great Britain does not stand alone in her abandonment of the animal as our farming partner or in animal husbandry without locally grown crops to support it. Examples abound all over the world.

Let us first consider some examples of monoculture in which the animal has been banished almost completely. Perhaps the best are furnished by the plantation industries overseas such as tea, coffee, cacao, sugar-cane, rubber, coconuts, bananas, maize, and cotton. A history of ever-advancing disease and the need for a constant stream of new varieties is Nature's reply to this attempt to flout one of her laws. The plantation industries, as at present conducted, are entering into their twilight. They flourished as long as the capital of the virgin soils lasted. There were no animals to help in providing the high-quality humus needed to make good the drain on soil fertility. The result is to be seen in their present sorry plight. But in fairness to these industries, the pioneers have already indicated the road by which present failure can be transformed into future success. Some of the tea, cacao, and coffee estates have already begun to take the animal back into partnership to restore both the fertility of the soil and their own prosperity. One such example is described in Appendix A of *Soil and Health*. An account of some others—coffee in Central America and citrus in Southern Rhodesia—has already appeared.

Great Britain has been much slower than her possessions overseas in the removal of the worst consequences of mono-culture. To maintain production in the potato crop, for example, reliance is still being placed on the manure bag, on the poison spray, and on frequent changes of seed. As will be evident from Professor Newcomb's results; a fertile soil will make the manure bag and the poison spray unnecessary. The experience of the islanders of Tristan da Cunha proves that with organic manuring any variety of potato will last at least a century and the seed need not be changed.

Failure also follows any attempt to concentrate on live stock at the expense of the crop. The periodical disasters of the sheep farming of Australia due to shortage of food in times of drought are notorious. In this country the development of milk production based first on imported feeding stuffs and now on produce largely raised by artificial manures has lowered the power of reproduction of the cow from the normal twelve lactations to round about three. Moreover, many of the animals which yield the nation's milk are rotten with diseases like tuberculosis, contagious abortion, mastitis, and troubles of the alimentary tract.

In all these cases we see the way Nature hits back when her rule about the correct relation between the plant and the animal is disregarded. She is trying to tell us that we shall have to retrace our steps and restore the natural partnership.

But the official advisers of our farmers are doing their utmost to sidetrack Nature's warnings by bolstering up the findings of experiment stations like Rothamsted and those dealing with fruit production where hardly any live stock are to be seen. Animals are still being replaced by artificials and spraying devices. These

substitutes are now excused by statements that it is impossible to replace them by high-quality compost because of the absence of the raw materials needed and of the cost of their conversion into humus. These advisers forget that the residues of over forty million people are running to waste, that the correct utilization of sewage sludge has begun, and that the compost age in Great Britain is already dawning. As the small trickle of results grows into an avalanche—as is now happening overseas—it will soon be realized that *the animal is our farming partner and no practice and no knowledge which ignores this fact will contribute anything to human welfare or indeed will have any chance either of usefulness or of survival.*

You Can Help The Organic Cause

You can help by handing out our subscription-getting booklets to gardeners in your community. Even neighbors, co-workers, fellow members in your church, clubs and organizations are prospects. They will thank you for giving them this booklet, for it may be the means of converting them into successful, organic gardeners. It will show them that fertile soil is the foundation of healthy crops, healthy live-stock and healthy human beings. It points out the folly and dangers of using chemical fertilizers.

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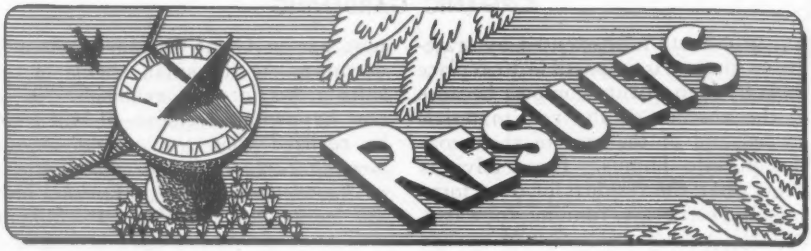

NEW YORK SUCCESS

June 8, 1947.

I am a subscriber to your magazine and have just finished reading your "Pay Dirt". Believe me, I am an enthusiastic disciple of organic gardening and am trying to spread the idea among all my gardening friends. Last year, when I first became convinced of the value of gardening organically I applied your methods to my own garden. In previous years I had been kept busy spraying from one end of the season to the other but in 1946 the half pint of spray that I bought more from force of habit than from need was barely used. Thanks to the lateness of the frost in this vicinity we picked tomatoes until December and there was no evidence of the blight which struck so severely through the East. I hope to start an orchard soon and will certainly do so along organic lines.

Vincent C. Tymann,
42-35 66th Street,
Woodside, N. Y.

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STRAWBERRIES AND PARSLEY RESPOND TO COMPOST

July 20, 1947.

In one of the richest, most heavily composted beds of my garden I have a Rockhill strawberry bed. They are thriving very well, their leaves being of the darkest green color imaginable. This spring when I pulled the mulch of leaves off the bed, the earthworm castings completely covered the ground. Parsley, two feet high, borders the bed.

Russell Pratt,
1017 Queen Avenue,
Yakima, Washington.

OREGON TESTS ORGANICS

July 5, 1947.

Have been trying out organic gardening for five years now. When I started I used to have a lot of trouble with blossom end rot on tomatoes. This last year I did not have one single case of it. I have grown them on the same piece of ground all this time too. I plan to grow this years crop there too. The tomatoes are of a very excellent flavor and texture.

I notice that my earthworm population is very much increased now that I don't poison them to death with chemical fertilizer.

Mrs. D. Juttner,
R. 3, Box 147,
Park Drive,
Corvallis, Ore.

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BEANS WITHOUT INSECT PESTS

June 10, 1947.

First, let me say the best investment I ever made was the day I sent you three dollars for a year's subscription to Organic Gardening and the little booklet you sent: Compost—How to Make It.

Up to that time we were using chemical fertilizer and not at all satisfied with the results, so we stopped using them and took your advise. Now our place is looking as it should.

I could not understand why we never saw any earthworms. When at home as a child (Georgia) we had them that sometimes looked like young snakes and then I remembered I never saw bags of fertilizer around, but always cow and chicken manure

made into huge piles with leaves and dirt. So when I received your book I knew that I had found the right way to grow anything I wanted to grow.

Last year I read in one copy of Organic Gardening about rock mulch, so one day while my husband was busy in the garden I decided to rock mulch the plants in my back yard, including two crepe myrtles that had not grown a foot in five years. Well, I was not able to walk for about three days but believe me, my work is paying off this spring. The two crepe myrtles would not be recognized as the same plants.

Before, when we planted beans, by the time they were three inches high, they were full of holes where bean beetles had chewed the leaves and the plants would be yellow with the little pests, which meant we had to dust and spray, but this year our beans are up tall and ready to bloom and nary a beetle or bug.

So you see why my husband and I are Organic Gardening and compost fans.

Mrs. Robert R. Wolverton,
6331 Branch Avenue, S. E.,
Washington 20, D. C.

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INSPIRATION AND SUCCESS

June 17, 1947.

Saying that I enjoy Organic Gardening is stating it mildly as I read every page of each copy, including the advertisements, and although I seldom write editors I must tell you that I think the June copy is "tops." It has been a long time since I have read a more thought provoking article than "A Discussion With a Botanist." I would like more of it. Has Dr. Pulling published anything covering his observations?

On Page 26 Mr. Frank Hinckley says "With no heavy tractors thundering through the grove—no sharp discs to make 'mincemeat' of these beneficent little 'earthworkers'", brings forth more brain exercise. I have seen such excellent results in improvement of gardens in which dried old sewage sludge was worked in the top soil with the tiller type of cultivator that now I am wondering what the tines did to the earthworkers. Did it make mincemeat out of them, and if so, has the improvement proved detrimental? What does the Editor, his staff, and the readers of Organic Gardening think of this?

A neighbor who two years after having read my copy of PAY DIRT has gone all out for Organic Gardening, uses a tiller cultivator and has the best looking garden I have seen since the days I was a child when a canal-feed reservoir in northern Ohio was drained and planted. Two-year strawberry vines to your knees, so matted that a row had to be cut through them and the best crop of fine berries one ever saw. Everything is of like growth and production.

Yours in the interest of health through organic compost.

Emmet C. Kaufman,
Sgt. U. S. Army,
Route 1,
Severn, Maryland.

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QUANTITY AND QUALITY

June 18, 1947.

My sincere thanks for all the fine and valuable information obtained from the magazine. I am completely sold on the organic method even though I have not sufficient experience to make a complete report. The results where I have used compost are almost unbelievable. Example: Last year I did not have sufficient material to cover the entire garden so I merely used a small spadeful with each of forty-eight plants. Three plants failed to survive or even get a start. From the remaining forty-five plants we picked thirty bushels of the finest tomatoes I have ever grown and not a cracked one among them.

Dr. R. J. Albright,
Michigan Avenue near Monroe,
Dearborn, Michigan.

Fermentation versus Putrefaction and Decay

By DR. EHRENFRIED E. PFEIFFER

TWO processes are significant on the path of life which leads to the formation of organic matter. One is an upbuilding process which all matter undergoes when it is organized by the living bodies of plants, animals and man. The other is a breaking down process which impairs and transforms "life" matter after it has been used up and fulfilled its task for the building up, growth and maintenance of the living organism. In nourishment we have a special case, where outside matter (food) is broken down through digestive action and transformed into forms of matter to be used "inside" for the growth and maintenance of the body. This, however, is not a complete breaking down but a fermentation. Enzymes are chemical substances which support and direct this fermentation, for instance in the stomach and small intestine. There are also fermentations taking place in nature, in plants, under the influence of yeasts and bacteria. Fermentation is therefore a third process which stands in the middle between the building up and breaking down of organic matter as a kind of "mediator". A typical "fermentation" is for example the transformation of sugar into alcohol and carbon dioxide under the influence of yeast. Another fermentation takes place when wheat or other flours are transformed into bread dough, also through yeast. This process is interrupted at a certain level, namely through the baking of the bread. Should it be permitted to reach its ultimate state, alcohol would be formed out of the starch. As a matter of fact, when we digest bread a certain amount of alcohol is formed in the stomach.

Fermentation we therefore call a transformation of organic matter (especially carbohydrates) so that it can remain and play a role in the organic process, supporting life. Another example of a fermentation process is the hydrolyzation of starch resulting in the formation of sugar. In addition to yeasts, certain molds also aid fermentation. It is of special interest to all industries making use of processes of fermentation to control and direct these processes in such a way that only favourable products result. They try, through controlling these procedures, to eliminate all disturbing factors such as "wild" yeasts. Their cultures are inoculated with selected strains of yeast in order to obtain the proper results (cf. the manufacturing of cheese, wine, beer, vinegar).

Decay is the final process when living matter "dies" and falls apart into its components, which are excreted from an organism and not immediately used in the resultant form. Manure, i.e. any product which is excreted through the bowel movement of an animal or human body, is the final product of the digestive action, of no more use for the building up of the said organism. It is, however, still rich in highly organized organic matter, proteins, sugar, peptones, and undergoes a further decomposition outside in nature towards the simplest forms of organic matter, namely, into minerals, respectively salts, ammonia and carbon dioxide. When these forms are reached the end products are no longer fit for organic upbuilding. They will be lost unless they are taken up again by plants and organized anew.

The decomposition of manure as well as of any organic matter (including the dead bodies of plants, animals, etc.) may follow a disorderly course. Putrefaction is a mere "decay" which can be just a chemical disintegration

of animal matter, proteins especially, or it can also be fostered by certain bacteria which thrive on the products of a partial decay. Such putrefaction is characterized, in general, by a foul odor, by producing slimy, smeary masses, if moisture is present. Poisonous products such as ptomaines, mercaptans and hydrogen sulphide are formed. In the end, these products will hinder any life process. Under certain abnormal circumstances a putrefaction can also take place even in the intestinal tract, gas formation being one of the symptoms. Decaying manure, as well as plant material and animal bodies, undergoes putrefaction and fermentation at random according to chance conditions of heat, moisture, and the influence of micro-organisms which may exist under these accidental conditions.

It is in the interest of the farmer and gardener to control these conditions as well as the wine, beer, cheese, and alcohol manufacturers control their processes. Should the random decay go so far that finally salts, carbon dioxide, ammonia and free nitrogen result, then all organic matter is lost, because these end products are washed away or escape into the air. Resultant byproducts such as methane gas (marsh gas), hydrogen sulphide would even hinder the development of life. The decay must, therefore, be arrested in time and directed toward producing a kind of material which is stable rather than unstable. In other words, before the breaking down is complete new upbuilding processes have to be introduced. Humus is the stable product which results if the decay is checked in time and upbuilding micro-organisms turn the wheel of life before it is too late.

This is the "secret" of composting methods: to introduce such conditions of life that no final decay or putrefaction can occur, but that the microlife of the soil resumes its activity, bringing about a complicated yet stable structure or organic matter. Humus is not so much a definite chemical formula but rather a *state* of *existence* of transformed organic matter in connection with soil, soil life, moisture and air. It is a balanced state of matter, almost a living organism or condition in itself.

Certain bacteria live only upon decay or putrefaction, they only break down. In this class belong, for instance, all bacteria which form ammonia or nitrites. Ammonia and nitrites are unstable nitrogen compounds, apt to fall apart into free nitrogen, water and oxygen if not fixed in salts. The most stable forms of nitrogen compounds, on the contrary, are nitrates. A gardener who has a lot of ammonia or nitrites in his compost or soil will eventually lose them unless growing crops can make immediate use of them. The one who has nitrates in his compost and soil will keep them.

The nitrogen cycle in nature best illustrates this principle. We ask the patience of our readers in carefully studying the following schedule in order to get a vivid picture of the situation in his farm or garden.

1. Upbuilding process in plants and animals forms proteins.

2. Proteins break down into peptones, amino acids, finally to ammonia from decaying plants; the proteins from animals result in urea, which is excreted.

3. Urea bacteria in liquid and other manures from ammonia; this if not fixed is apt to be lost.

4. Nitrosomonas bacteria produce nitrites. These, if not immediately transformed, may be lost.

5. Nitrobacter and similar bacteria transform nitrites into stable *nitrates*. We speak, therefore, of denitrifying processes (No. 3 & No. 4, losses), and of nitrifying processes and/or nitrogen fixation (No. 5 & No. 6).

6. a) Nitrates in the form of potassium salts remain more or less fixed in a humus soil in "digested", i.e. properly decomposed manure and compost, namely when these remain in a humus state.

b) Nitrates are absorbed by other bacteria and form bacterial proteins and remain as long as the bacteria life

of nitrogen fixers is going on. Afterward these bacteria proteins break down, undergo the same changes, from ammonia to nitrites to nitrates again, until the latter are absorbed by plants or nitrogen is lost.

c) Nitrogen is absorbed directly from the atmosphere by the nitrogen fixing organisms which live in symbiosis with legume roots, besides those bacteria which fix nitrogen directly.

Remember: any putrefaction will lead to losses unless checked by nitrogen fixing organisms in compost, manure and soils. The presence of nitrite forming bacteria, if not checked, can be very disadvantageous to the soil and compost. Their action, called denitrification, leads to the permanent loss of nitrogen. These bacteria live mainly in moist, water-logged, peat soils and on the bottom of compost heaps, as described above, when air is excluded. Bac. denitrificans, Achromobacterium, Psuedomonas, Bact. pyocyaneum, belong in this group. They are robbers of the fertility of the soil. We quote from "Elementary Bacteriology", by Joseph E. & Ethelyn O. Greaves, M.S., Ph.D., W. B. Saunders Company, 1946, page 225:

"Denitrifiers need large quantities of organic food and develop best in the presence of the fresh plant and animal debris. From the standpoint of production it would thus be unwise for the farmer to use heavy dressings of nitrate and fresh manure, or to plow under with the nitrates green-manuring crops. Partly decayed barnyard or green manures do not appear to favor denitrification."

In other words, proper composting methods counteract the denitrification process even better than the above mentioned "partial" decay. Greaves say, therefore, with good reason: "we find this microbe (the denitrifier) a robber by force of circumstance imposed upon him by the farmer's injudicious handling of his soil".

Azotobacter, on the contrary, is the master nitrogen fixer. For each grain of sugar (carbohydrates) in manure or other organic matter, which it digests, it fixes 10 to 15 mg of nitrogen. This, together with the other non-symbiotic nitrogen fixers in the soil, increase the nitrogen content of soil from 15 to 35 lbs. per acre annually. If organic matter is added the increase reaches 40 lbs. per acre and more. With over 375 million acres under cultivation, this means a yearly gain in nitrogen of 2.8 to 7.5 million tons (the latter with improved organic methods) just by natural methods, and deriving only from one source which does not even include the legume bacteria fixation.

Another process occurs in the decomposition of starches, sugars and cellulose (lignin). All of these do not contain nitrogen as the proteins do but they also follow a cycle of decomposition leading to the production of carbon dioxide, which is lost in the surrounding air. Under aerobic conditions, i.e. with access of air, the carbon dioxide is formed. Under anaerobic conditions, i.e. without access to air, more complicated compounds, without oxygen, result, such as organic acids, and even methane gas or inert products, including carbon. A carbonization process is responsible for the production of peat, inert hemicelluloses which do not ordinarily enter the life cycle again. The latter happens when organic matter decays on the inside and bottom of a compost heap, where there is no air and lots of moisture. Many of you readers have certainly observed methane gas or blackish-brown or greenish, foul-smelling masses inside the lower part of heaps. There you had a typical putrefaction, the products of which are about the opposite of a good humus fermentation. This can be avoided by proper and sufficient aeration and control of moisture. Anaerobic bacteria belonging to the Clostridium family work there. Such strata in a heap develop gas, and, on account of their acidity (mineral and organic), they do not allow the nitrogen fixers to grow which, for their part, prefer an almost neutral medium.

Not all of the carbonic acid (car-

bon dioxide) is necessarily lost in a compost fermentation. It is lost when it can escape freely—in the case of a loose, scattered material which is not protected and covered. A heap should be trodden down enough to procure a spongy, porous structure and covered with a layer of earth. Then the carbon dioxide is retained and made available for such micro-organisms, bacteria, fungi, as can assimilate it. Azotobacter, for instance, which fixes nitrogen to nitrates, produces 1.3 its own weight in carbon dioxide during a twenty-four hour period. Whenever you complain again that organic and biodynamic composting methods severely prescribe covering a heap with a layer of earth, only think what you would lose otherwise and you will realize the importance of the cover.

Another rapid process of decomposition, chiefly of cellulose and starch, takes place when organic materials become overheated. Here thermophile cellulose digesters, which thrive at temperatures of 120 to 145 degrees F., do a quick job. This hot fermentation is a more or less slow "burning" process. Molds will grow, for instance, the greyish white molds you frequently see in hot, dry horse manure or compost heaps made of dry weeds, loosely piled up and not covered. Here aerobic, mostly sporing bacteria act, bringing about a quick fermentation at the expense of considerable losses of nitrogen and carbon dioxide. A powdery, dusty, loose product results which is easily absorbed by the soil, but it is not humus and is not in a stable form.

Again we see the need of putting on the brakes which, in the case of this process, is done by treading the material down so as to exclude part of the air, and by increasing the moisture (watering). Frequently, when horse manure and compost heaps heat up, there is nothing left but to turn the heap and set it up again. At this point, we should not hesitate and wait until everything is burned up. We have often checked our heaps with a thermometer. The temperature should remain below 115 degrees F.

What we really want to establish is a balance between decomposition, putrefaction, fermentation and a new upbuilding process before a final disintegration occurs. Humus in its truest definition is this stable state which holds everything together—a directed, balanced fermentation (in a broader sense) versus decay and putrefaction.

The benefits of such a balanced state are obvious. Cellulose digesters, for example, liberate sugars and carbon dioxide. Azotobacter uses them up and in turn fixes nitrogen. In a heap, or soil, of too acid a reaction Azotobacter will not grow—only in a soil near the neutral reaction. One group of organisms will prepare the path for the next one if we only take care to maintain proper conditions. We quote from the interesting chapter on the carbon style in Greaves' (pp. 213 and 214):

"The cellulose ferments break the plant residues into less complex organic compounds which are decomposed by other micro-organisms with the generation of large quantities of organic acids. These acids react with the minerals of the soil and render them available to higher plants. This very likely explains the beneficial results when raw rock phosphate and stable manure are used on phosphorus-poor soil. The fermentation of the cellulose yields acids which render soluble the phosphorus. However, the production of acids may at times become excessive, thus giving rise to the sour humus of moors and heaths.

"The cellulose ferments also perform direct beneficial functions in the soil, for instance in the liberating of plant food which is bound up in the residues of plants. They are the organisms which decompose the cellulose of straw so it can be utilized by the Azotobacter in the fixation of atmospheric nitrogen. More recent investigators have shown that under suitable conditions the Azotobacter may fix 325 mg. of nitrogen for every 100 gm. of straw decomposed. At this rate there would be a gain of 7 pounds of

nitrogen for every ton of straw utilized. This, in addition to other beneficial effects, the farmer loses when he burns his straw. The cellulose ferments are being used in the synthetic production of manure. Investigators at Rothamsted have shown that if a straw heap is treated with the correct proportion of ammonia and inoculated with cultures of *Spirochaeta cytophaga* it changes into a substance having the appearance of a well-rotted manure."

There is for instance the phosphate cycle. People who have not carefully studied the organic methods criticize them and say: Well, you get organic matter all right, but you still have to add potassium and phosphate fertilizers; compost and manures cannot take care of that.

The writer has analyzed a great number of compost and manure samples, fresh material as well as old, some samples deriving from heaps one, two or more years old. If properly handled, older heaps can contain a lot of phosphates, more than fresh ones. These are available phosphates, easily absorbed by plant roots. In a fresh heap with "raw" material we may have a lot of phosphorus compounds; these also exist in the interlayers of earth rock, gravel. Granite rock pieces are rich in potassium, so are plants, wood shavings, and sawdust. These are also phosphoproteins, nucleoproteins, lecithin, all rich in phosphates but not in an available form. All these forms of phosphate are rendered soluble, transformed by bacteria, no matter whether they derive from inorganic or organic sources. The phosphate transforming organisms need carbon dioxide. Water charged with carbon dioxide, is an almost universal solvent of original rock particles; in conjunction with the micro-life it aids in the liberation of magnesium, iron, boron, phosphorus, manganese, aluminum, potassium (hence the importance of interlayering a compost heap with layers of earth, thin enough so that each particle is accessible to the life process). In composts the transformation of phosphates is rapid and almost complete. We quote from Greaves' again, page 245:

"Moreover, soil organisms form, among other products, formic, acetic, lactic, butyric, and other acids, the kind and quantity of each depending upon the specific micro-organisms and upon the substances on which they act. These substances are certain to come in contact with some insoluble plant food which they may render soluble. This may be concentrated by the soil microbes in their bodies which are especially rich in phosphorus. The phosphorus, on the death of its host, is probably returned to the soil in a readily available form."

It is calculated that phosphate losses in the United States total an amount annually which would fill a train of standard box cars reaching from Seattle to Boston, representing 7 to 12 times the world's production of rock phosphates (in 1911). The organic gardener and farmer can help to reduce these losses considerably by introducing the proper cycle in his composting methods.

Manure Can Keep Fertility Up

CORN YIELDS were investigated in Kentucky by Weeks and Fergus and the composition of the corn was also studied with care. Bulletin 485 states among other things: "Manure was effective, along with the rotation used, in maintaining nitrogen at a satisfactory level, and so far as corn was concerned it was sufficient to maintain fairly adequate supplies of potassium in the soil." Thus phosphorus is the problem left. Since rock phosphate in conjunction with manure propuced highest yields in several trials elsewhere, it would seem to be the very thing needed to keep the soil in fertile shape.

Philosophy in Agriculture?

By REV. HENRY RETZEK

LATELY, quite a barrage of vituperatives has been loosed on those who dare question the efficacy of chemical fertilizers as a panacea for soils robbed of their fertility. "Mystics", (1) "Charlatans" (2), are among the terms used. The uncharitableness culminates in a listing of specific names. Each name heads some fractional quotations from their writings. (3) An example of the spirit motivating that writer is this sentence: "Their proponents skip blithely from fact to fancy and fall back on the supernatural when pressed by the scientist". (4)

It is tragic when such methods are used by anyone in defense of a philosophy. The many questions that urgently require answers cannot be solved with ridicule or contemptuousness. Ideal Science is pictured as being so cool and collected. Open-mindedness is emphasized. No clue of any kind is by-passed. What cannot be answered with a definite 'Yes', or 'No' will be given the benefit of doubt by a courteous 'Maybe'? There are some 'big' men in science. You can recognize them—not by arrogance and contemptuousness—but by their humility. These have become so wise that they recognize their limitations. In their charity, because they are gentlemen, they lend a kind ear towards contrary opinions. This they do—because—they are never dogmatically positive. Their experience has taught them caution, particularly, in conclusions.

With soil depletion becoming so alarmingly bad, the question of what constitutes sound, permanent, fertility-restoration practices, —some, in positions of authority, try to make it a CLOSED CASE. Chemical Fertilizers is their answer. Anyone daring to contradict, is met with the barrage as outlined in the opening paragraph of this article.

To be 'old fashioned' and emphatically advocate as dominant in this fertility-restoration program the value and use of barnyard manure, compost and more and more green manure is met with this: "Such teachings link the farmer inseperably with manure piles and peasantry. They set aside some of the most important findings of a century of agricultural science. They throw the 35 million-ton lime and fertilizer industries of this country into discard. They decry the work of the agricultural experiment stations." (5)

Trying to make the chemical fertilizer question a "closed case" is a bit arbitrary. Or, are these chemical fertilizer proponents on such sure grounds? Is there never a question of doubt in their own minds? Their master Liebig, was he infallible? Since his day quite a bit of new knowledge has been acquired both in chemistry and in soil study. Does none of this knowledge acquisition modify his dictums? As an example: most of Liebig's conclusions on the mineral content of the plant rests on his analyses of their 'ashes'. According to him one element, specifically, was never found as very high in plant content. However, in 1911, when other methods were devised for the ashing of plants—that specific element was found to be much more prevalent than he had ever estimated. (6, 7, 8.) If a Liebig can be accused of error in this manner—how much more is there in his philosophy that could stand a

steel-brush revision? The National Chemurgic Council report 1389 carries this quotation: "Even in their patent claims Liebig and Lawes disclaimed any virtue as deriving from the greater solubility of the so-called superphosphates, definitely stating that they would revert to insoluble form within a short time after being put in the soil. They did claim that after such reversion they would have the fineness of chemical precipitation and hence be more quickly available than the coarse ground product then already in regular but limited use for 50 years or more. Had they been mechanical engineers and worked to achieve fine grinding there might have been no superphosphate industry." (IFS, Dec. 25, 1945.) This last would give the superphosphate adherents room for thought about using his name as a recommendation.

Hopkins, author of 'Chemicals, Humus and the Soil', a proponent of chemicals, remarks: "Similarly, and though as I have tried to show, quite a lot of the fertilizer advertising has stressed the humus need, there has been far more publicity for fertilizers than for manures. After all, fertilizers are manufactured for sale; most manures are made on the farm for use and there is no primary commercial transaction in the operation". (page 251)

Reluctance in definite conclusions is highlighted by another quotation from this same Hopkins. He quotes Michael Graham in Soil and Science. "It is also noticeable that there has been a change in the written advice of successive generations of scientists. It used to be, "artificials instead of dung", from some men at any rate, whereas nowadays we mostly read, "artificials with dung". If this goes on it may be "dung, of course" by 1950, and "dung, not artificials" one day." (page 251)

Returning once again to the article of the "Mystics" and "Charlatan" provocateur: His method of including "lime" with the chemical fertilizers is peculiar. Even those he chides urge 'lime'—though they may abhor the chemicals. The appeal for 'pity' when one considers the enormous investments of the chemical fertilizer industry is a unique argument for the use of their products. But, it is the matter of thought he presents, later, in his article that demands attention. He states: "It is believed that the field of nutrition offers the most promising line of attack in extending the lifespan of man. As previously pointed out a deficiency of one or more minor elements or a lack of balance in those of the major group of fertilizer elements may be responsible for part of his troubles." (9) And again a little later: "No doubt there is some connection between fertilizers and human health, and the fertilizer industry would do well to finance an extensive research program to study this problem. A one-sided fertilizer program could lead to human disaster, just as an up-and-down-hill plowing with a tractor could lead to land ruin." (10)

But that is exactly what these "Mystics" and "Charlatans" have been doing. Their "research" is already far beyond the initial stages. It seems, though, that their findings to date, quite contrary on many points to our preconceived notions may have caused the 'irritation' so often manifested by such writers. On this point Hopkins remarks: The humus enthusiasts have pulled us all up with a jerk in drawing such forcible attention to humus". (250)

A few lines above, the remark that the deficiency of one or more minor elements may have a part in our troubles is not without some good evidence today. Organic matter return to the soil is and will be one of the chief means of getting these 'minor' elements back into the soil. If the day should dawn that "trace element" depletion becomes pronounced—then our troubles would really begin. For in this as in other things, we are already wasting enormously what we do not even know. Between 30 to 50 is the number of elements found in the soil already. Most of them are physi-

ologically 'unknowns'. In amount those known may require from an ounce per acre to a matter of a few pounds, (like borax with its 5 lb. recommendation to the 3 ozs. of molybdenum). One neutral source considering the amount of such trace elements in the chemical fertilizers remarks: "It will be noted that many of the synthetic fertilizers are apparently manufactured with a high degree of purity, since the presence of more than one or two metals could not be detected. On the other hand some of the samples of phosphate rock were found to contain small quantities of many elements." (Cornell Mem. 174) (page 31)

Clearly, these later quotations show that the writer answers my previous question: "Are these chemical fertilizer proponents on such sure grounds?"—with a fairly definite NO. Doubt is in *their* minds. Why then this vituperative irritation? A possible explanation could rest in this quotation:

> "The scientist with a theory, will, if he is human, cling to it perhaps a little longer than is scientifically warranted. A mass of data has been collected along a particular line of research. There is tradition and there are loyalities. It is difficult to change, and more difficult still for a member of an industry who is defending its existence". (11)

Above all if Science is to return to its own all those interested in Soil and its Fertility should cut the bonds that so closely ally them today with the fertilizer Industry. These commercial interests practically dominate our tax-paid setups. There is a constant interchange without reluctance or hesitation. Even the scientific societies see no wrong in having their convention in the same city, same hotel, at the same time with the members of the industries. In fact they not only have 'joint' meetings—but even allow themselves to be wined and dined by these same companies. How can they keep an OPEN MIND on questions of Fertility Practices—when they already are under a certain indebtedness to such prejudiced intrests?

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General view of the fertilizer factory of Araujo and Co.

The Evolution of Composting In Central America

By MARIANO MONTEALEGRE

Director of the Instituto de Defensa del Café de Costa Rica

IT was in April 1936 that for the first time I heard the name of Sir Albert Howard and the Indore Process in a short article in the *West India Committee Circular*. The new process from the very beginning struck me as something significant.

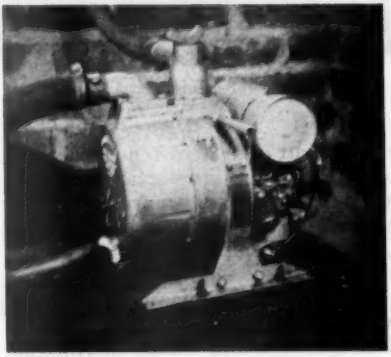
I had been in the coffee business from my early youth; in fact I have been, since my return from Downton College of Agriculture in England, for thirty years Superintendent of the largest coffee concern in Costa Rica—the Lindo Bros. Coffee Plantations.

Being a graduate of a College of Agriculture, I was naturally NPK minded; but to my sorrow, and after many trials, consultations, soil analyses and combinations, I was convinced that chemicals and coffee did not seem to agree and I began trying fish manure which I obtained from the Humber Fishing and Fish Manure Co. of Hull, England. The difference was so amazing that I applied for their agency which I worked with great success until the war stopped the supplies. The results were really astonishing not only with coffee, but with sugar-cane, tobacco and all other crops.

So, when I had the privilege of establishing connection with Sir Albert Howard, I was already convinced of the failure of chemicals in the tropics and of the necessity of using organic manures in their stead but was entirely at a loss as to procedure. The old-fashioned compost heap (not Sir Albert Howard's kind) was so tedious, took so long to ripen, and was so unsatisfactory in the end that I tried it to abandon it soon after. I had also tried the burying of fresh town wastes around coffee plants and although the results were good I had to abandon the idea on account of bad odours, swarms of flies and the unburying of the material by poultry and other animals.

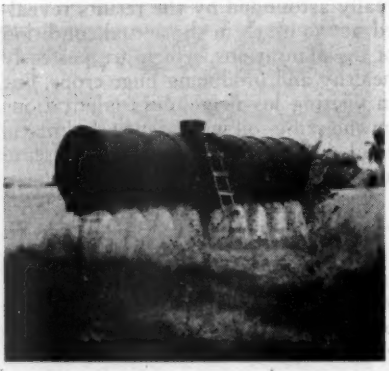
The copy Sir Albert Howard kindly sent me of his 1935 lecture before the Royal Society of Arts was a revelation and I started experimenting with the Indore Process. Soon after, having been appointed Director of the Instituto de Defensa del Café de Costa Rica and in view of the wonderful results obtained, I decided on a campaign in our magazine in favour of the new idea. It began in March 1937 with the circulation of Sir Albert's 1935 lecture. In January 1939, a special issue of the *Revista* which we entitled 'In Quest of Humus' (En Busca del Humus) was entirely devoted to papers describing the Indore Process and its developments. This issue was

Exit-mouth of the sewer of fecal waters of the city of Santa Ana from the vicinity of which they are pumped to the storage tank shown in another picture.



Pump for conveying fecal waters to the 8000 gallon storage tank.

Truck for collecting and transporting refuse—one of those recently acquired by "Araujo and Co."



Storage tank of fecal waters—capacity, 8000 gallons.

Peasant stirring a pit.

Some peasants filling a row o

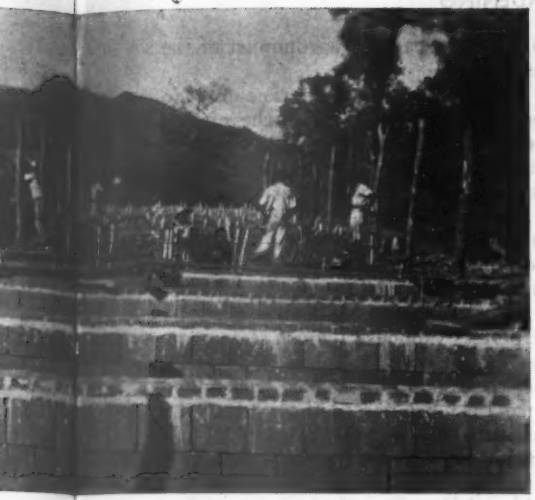
entirely out of print two months after, but we had the satisfaction of seeing many of the papers reprinted in the agricultural magazines all over the Continent. The campaign was in full swing.

The first coffee planter to put the process into real practice was, no doubt, Don Pedro Cofiño of Antigua, Guatemala about eight years ago. I had the privilege of visiting his plantation in October last year and was really astounded by the results revealed not so much in the actual condition of his plantations, which are perfectly healthy and producing huge crops, but in visiting his neighbours' plantations on the same soil with identical climatic conditions which are full of disease and producing less than half as much.

The great objection raised by planters who have not experimented with the Indore Process is that it is impossible to get enough material in one's own plantation to make the necessary compost to manure it. After eight years' experience Mr. Cofiño stated before me at a meeting of coffee planters on his farm that 'every plantation has enough vegetable wastes to make the compost needed for its size but at

Another view of some peasants stirring and mixing pit-matter.

Storage tank of the shape "Standar"—10 meters long by 3 wide—with special apparatus toward the bottom for preparation of the compost, showing the ventilation system.



ats filling a row of pits that have not yet been roofed-over.

Row of filled ditches showing the system of ventilation with perforated bamboo tubes. Note how these pits are filled to over-flowing before the first stirring.

Row of pits 10 days after filling and after the first overturning, showing the shrinkage in the process of disintegration. Note that the pit recently stirred is being sprinkled with fecal waters.

A row of filled pits with their bamboo ventilation tubes, showing the irrigation with fecal waters that is done periodically.

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first he had to overcome the lack of animal wastes.' In an old barn he stabled a few cows with the sole idea of using their dung for his compost. He very soon found out that the selling of the milk not only paid for the care of the animals but that it also was a nice side business in itself. He now has twenty cows and is making arrangements to raise the number to forty. He sells all the milk he produces in the neighbouring town of Antigua and so has added a new and quite handsome income to his already well-paying farm. His example has aroused the interest of planters in Guatemala and not only are several of them already experimenting with it, but there is also the idea of forming a company to utilize the wastes of some of the towns.

On my way to Guatemala I stopped for a few days in the Republic of El Salvador where I found the same enthusiasm. Quite a few planters and gardeners have started producing compost on their own properties, but the outstanding fact in El Salvador is that they are already producing it on a commercial scale.

My principal reason for this trip was an invitation from Messrs. Araujo and Co. to visit their Vital-Humus

plant in Santa Ana. I must confess that I was a little dubious about it and felt somewhat nervous for having been a factor in their going to the heavy expense of putting up the factory. I felt relieved the moment I entered it. These people have done a really wonderful job. When completed the plant will have 225 brick-laid pits 10 metres x 2.75 x 0.90. When I visited the plant three months ago, they only had fifty in operation; they were exceptionally well aerated and their daily production was already between 12 and 13 tons, with orders ahead for more than 600 tons. They claim that they are only using about one-fifth of the town wastes and feel confident that even when in full operation the demand will be greater than the supply. They are preparing a full report for *Soil and Health* so I will only add that the premises were absolutely clean, no bad odours anywhere, really not one fly to be seen, and not one complaint from the health authorities of the town.

The conservatism of the men of the soil is universal and Costa Rica is no exception. In this particular case the handicap was still greater, for as we say in Spanish 'no man is a prophet in his own land' and while the new idea was taking hold in all the neighbouring countries it was laughed at in Costa Rica. Six years went by and no real progress was made.

In 1943 I was appointed Secretary of Agriculture and I decided on a change of policy to further the scheme. I called Mr. Vance Rogers, Chief of Party of the Institute of Inter-American Affairs, Food Production Division (an agency of the U. S. Government which collaborates with local governments in Latin America for the improvement of agriculture) and explained the situation. I was convinced that a series of experiments conducted and recommended by the Institute would work a miracle. Mr. Rogers, after studying the Process, offered the collaboration of his organization and the experiments were undertaken under the direction of Mr. G. C. Kincaid, a very capable agronomist of the institution.

The success was instantaneous. No sooner had the results of the experiments been published than inquiries began to pour in from planters and gardeners. The miracle was twofold, it not only aroused the interest of the cultivators but also and, no doubt more important, made the Institute of Inter-American Affairs our best helper in the propagation of the new idea. To be perfectly honest I must state here, and I do it with real pleasure, that all the credit for what has been done since 1943 belongs to the staff of the Institute of Inter-American Affairs, for not only Mr. Rogers and Mr. Kincaid, but also Mr. Octavius J. Schofield and Don Jorge León became convinced supporters of the cause and have since then given great importance to the furtherance of composting by the Indore Process in all their work with planters, farmers and gardeners throughout the country as will be seen in the following report prepared by Don Jorge León.

'With the co-operation of the Secretary of Agriculture the Institute completed a series of trials on composting by the Indore Process in 1944 at the Municipal Crematory in the town of San José. The work was done under the supervision of Mr. G. C. Kincaid, one of the Institute's agronomists and its results published, first in the *Revista del Instituto de Defensa del Café de Costa Rica,* Vol. XIV, No. 117-118 and in pamphlet form later on.

'In view of the results obtained it was decided to interest farmers and planters in the new process and an active campaign was started. From the very beginning we had a good response even from small vegetable gardeners with small holdings as well as from potato growers and others.

'As the trials had been made in pits we at first followed this system in the field but we soon found that, on account of climatic conditions and heavy rains, heaps had the advantage of insuring a more even and quicker fer-

mentation as well as being a good deal cheaper.

'As was expected our greatest success was achieved in the Province of Cartago, especially on the slopes of the Irazu Volcano and around the big dairy farms where the growers, especially growers of potatoes and vegetables, could get all the dung they needed for their compost.

'During last year (1946) the Institute was able to start the making of compost in 112 small holdings as follows:—

	Pits	*Heaps*
Cartago	17	84
San José	7	2
Alajuela	2	0
Total	26	86

'Although the depth of the pits has always remained the same we have changed the overall size to suit the convenience of the very small owners. All the pits made during last year were either 14' x 30' or 8' x 5'.

'As for the heaps we have adopted the sizes 10' and 14' x 5'. With the exception of the excavations for the pits, the costs are really insignificant even with the subsequent turnings.

'The total cost of 16,000 lb. of compost (contents of one pit) is around C150—(26.45 American dollars) and the chemical value of the compost based on the current prices for commercial fertilizers is C250—($44.10). These comparisons take no account of the invaluable addition of organic matter to the soil. The costs are very considerably reduced with the system of heaps but we have not yet any exact data.'

The Institute has also collaborated with coffee planters who have asked for help and due to its organization and the enthusiasm of the staff the number of coffee planters who are adopting the Indore Process grows every day.

The following are the pioneers: Edgardo Salazar, Edmundo Montealegre, Octavius J. Schofield, Alvaro Esquivel in the Province of Cartago, Adrián Collado Montealegre, Alfredo Núñez, André Challe in the Province of San José and last but not least Enrique Flach who has started a small plant under the name of Organisal and is using a small amount of the town refuse of San José.

I feel confident of the future. The principles of soil health are better and better understood and every day new men enlist in this campaign for a better agriculture and better health. The common sense of the idea, based on the teachings of Nature, is so clear that even the most ignorant peasant

Compost in its last stages of decomposition, showing the considerable reduction that the compost has attained in its processing.

Truck discharging compost that has been taken from the trenches in order to be sifted and pulverized by the mill—note also the system of sieves near to the warehouse.

is becoming conscious of its soundness. The day is not far distant when we shall see organic agriculture as the outstanding agriculture of the world. I feel proud of having been one of the first to realize the magnitude of Sir Albert Howard's revolutionary ideas and to introduce them into the New World.

ANALYSIS OF MANUFACTURED HUMUS

The following is a letter sent in by Senor Montealegre, giving a chemist's analysis and costs.

March 4, 1947

Mario Pacheco supplied me yesterday with some estimates on your behalf of the comparative costs of Vital Humus and a fertilizer of the Hill Co. (formula 7-10-7.5), telling me that you wished my opinoin on this subject.

In the estimate made there appear the costs of fertilizer, shipment, application, etc., at the rate of 327 centavos per apple-tree for Vital Humus and 75.50 centavos per apple-tree for the other fertilizer, but the amount of fertilizer treated with Vital Humus was not reckoned in comparison with the other.

300 quintales (i.e., a quintal equals a hundredweight measure) of Vital Humus contain:

405 lbs. of nitrogen
870 lbs. of phosphoric acid
810 lbs. of potassium

2085 lbs. of fertilizing agents.

And 19,200 lbs. of organic matter besides—that is the most important thing!

The other fertilizer, applied at the rate of 625 lbs. per apple-tree, supplies:

43.75 lbs. of nitrogen
62.05 lbs. of phosphoric acid
46.875 lbs. of potassium

153.675 lbs. of fertilizing agents.

In other words, less than 10%, without counting the organic matter which the chemical fertilizer lacks.

So that, calculating the value of the fertilizers applied in equal proportions, the comparative cost of Vital Humus, reckoning the same amount of natural fertilizer as of chemical fertilizer, would be 10 times less, or about 32.70 centavos, and the cost per coffee-tree about 0.026 centavos, which is less than that of chemical fertilization and yet yields *gratis* the most important thing—the organic matter!

In conclusion, a treatment of 300 quintales of Vital Humus per apple-tree is equal to a 10 years' application of chemical fertilizer 7-10-7.5 at the rate of 625 pounds per apple-tree.

Hoping that these figures may be useful to you, I remain

Sincerely yours,

Mario Lewy Van Severen,
San Salvador,
El Salvador, C. A.

Lima Bean Plantings

Massachusetts State College found that lima beans planted with the eyes down made a better stand than those planted with the eyes up.

Garden Calendar — September

September is the best month of the year to study gardens, and make plans for your next garden. Has your flower garden been interesting and colorful throughout the spring and summer months? Does it include a wide variety of fall-blooming plants? Has your vegetable garden supplied you with an abundance of disease-free, wholesome foods? Have the flowering shrubs and lawn been all that you desire? Is your soil sufficiently rich in humus to be really fertile? Nothing can contribute more to the success of your garden than the building of compost heaps for the conversion into compost of the plant materials which are so abundantly available in September: autumnal leaves; stalks, husks, and cobs of sweet corn; garden plants from which the crops have been removed; weeds of all kinds; and kitchen wastes.

THE NORTH

Flower Garden:—It is high time to plant all members of the narcissus family (narcissus, Jonquil, daffodil), crocuses, snowdrops, chinodoxas, scillas, and other small bulbs. The depth of planting should be three times the height of a bulb. Bulbous irises and peonies should be planted not more than two inches deep. The September planting of these and such other hardy perennials as bleeding heart, lily of the valley, and most rock garden plants will permit them to become well established before winter. In all cases the soil should receive a liberal application of compost. The chrysanthemums should be compost-fertilized, and some of the buds should be removed so that a smaller number of more perfect and larger heads will be formed.

Seeds of hardy annuals as calliopsis, poppies, cornflower, and snapdragon can be sown outdoors this month. Self-sown seedlings of such plants as foxgloves, pinks, delphinium for next year's garden should be transplanted in the cold frames.

Gladiolus corms should be dug when the leaves begin to turn yellow. Ornamental gourds should be picked before the first frost. Strawflowers should be picked just as the heads begin to open and tied loosely in bunches to dry. Hydrangeas should be lifted and stored in the cellar until January. Small plants of geranium, calendula, petunia, begonia, marigold, etc. for early winter blooming in the living room should be potted at this time. Dahlias should be carefully staked and fed with compost.

Lawn:—This is the best time to make a new lawn or to reseed bare spots in an old lawn. Continue raking and cutting crab-grass to prevent it from seeding. Finely sieved compost and bonemeal are the best lawn fertilizers.

Shrubs and Trees:—Deciduous hedges should be trimmed for the last time this season. September is the best time to move coniferous evergreens. Deciduous trees and shrubs should be transplanted when their leaves begin to assume their autumnal colors. In transplanting holly, half of the leaves should be removed.

Vegetables:—Radishes, spinach, and lettuce may be sown in the coldframe for early winter use. Parts of the vegetable garden from which the crops have

been harvested should be seeded with winter rye or vetch as a cover crop to be worked into the soil and converted into humus in the spring.

Fruits:—Grapes must not be picked until ripe as they will not ripen if picked green. Pears should be picked before they get soft and allowed to complete the ripening process in a cool, dark place.

THE WEST COAST

Prepare the garden for the winter rains by removing all plant materials and rubbish and incorporate them in the compost heap. Work into the surface layer of the soil a liberal application of compost.

For winter blooming, sow seeds of sweet peas, petunias, violets, pansies, nasturtiums, lobelias, larkspur, calendula. Transplant seedlings of annuals and perennials previously sown. Make cuttings of hydrangeas, salvias, fuchsias, petunias, heliotropes, evergreens, privet, cotoneaster, myrtle, rhododendrons, evergreen veronicas, and rock garden plants. Plant irises and amaryllis. Treat lawns as indicated above for northern gardens.

THE SOUTH

Fertilize the roses with compost and bonemeal to aid fall-blooming. Plant small bulbs as indicated above for northern gardens. Peonies should be planted, but use northern grown plants as southern grown plants are not yet dormant. Do not cover them with more than two inches of soil. Sow the seeds of perennial flowers. Give the lawn an application of finely sieved compost and reseed the bare spaces. For a green winter lawn, sow Italian Ryegrass. Plant strawberries in the deep south, but use northern-grown plants. Now is the time to sow parsley, spinach, and many other vegetables for spring use.

Earthworms And Science

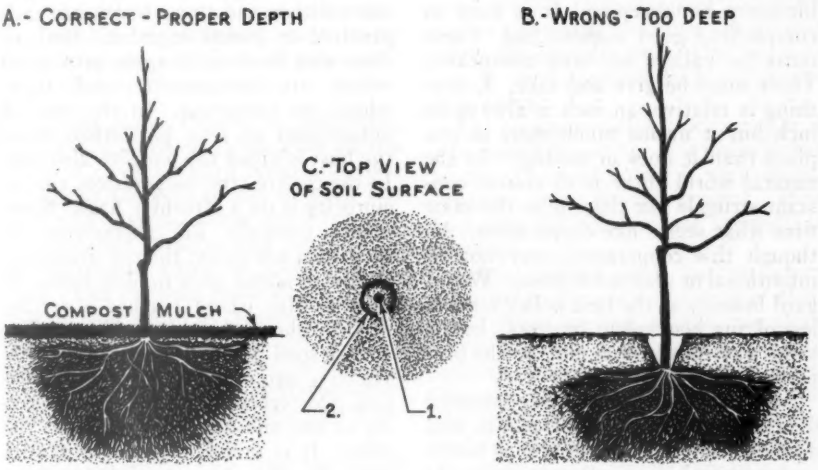
HENRY HOPP and H. T. HOPKINS presented a paper before the American Association for the Advancement of Science in Boston. The authors point out that the textbooks on agriculture are astonishingly reticent about earthworms, but were able to contribute information gathered from several years of experimenting under a grant from the *Soil Conservation Service* and in cooperation with the University of Maryland. It is hoped that the textbooks will in the future have a chapter on earthworm activity.

By J. COOK

Findings of a

TREE PLANTER

Regarding the Desirable Depth of Planting Trees



Under the compost mulch, strong feeder roots develop to a good length near level of the ground as shown in Fig. "A".

In Nature-sown trees, the hole around the trunk develops very little, if any, due to conditions similar to those in Fig. "A".

Fig. "C" is a view looking downward at the soil surface where tree trunk comes out of ground. No. 1 shows the trunk of the tree coming out of the ground. No. 2 shows the hole produced in the ground at the base of the tree trunk. This hole is caused by the swaying of the tree under pressure of winds especially during rainy weather when ground is soft, causing the tree trunk to be loose in ground, as in Fig. "B".

The unnatural and undesirable condition shown in Fig. "B", should be avoided. Rather, plant your trees as shown in Fig. "A". Then strong feeder roots just beneath the surface will tend to anchor the tree trunk.

Competition and Cooperation In Nature

By JOHN C. GIFFORD

Professor, University of Miami

THERE is an old saying in Europe that every joy is bought with sorrow. There is probably in all things a double-entry bookkeeping. It is hard to comprehend good without bad. There must be valleys to have mountains. There must be give and take. Everything is relative, an inch is always an inch but it means much more in one place than it does in another. In the natural world there is of course constant struggle but there is at the same time what seems like cooperation. Although this cooperation may not be intentional or planned it exists. We regard honesty as the best policy regardless of any benevolent motives. In the same way cooperation may be the best policy.

Scientists have long been concerned over certain activities of plants and animals. There are some things which are apparently beyond explanation. It is hard to comprehend how plants and animals could be good to one another without benevolence in mind and yet it is hard to ascribe any kind of conscious cooperation to plants or lower animals. Much of it is of course just accident without any planning on the part of either party. A bird for instance just happens to light in a tree to find food and shelter. He eats the fruits and scatters the seeds. He eats the bugs and drops guano to the ground which feeds the tree. Some long billed birds such as humming birds fertilize the flowers and feed on nectar. In the study therefore of these relationships the associations of living things can be classified into those which are disjunctive or separate from one another and those which are conjunctive or joined together. Both of these can be divided again into those which are antagonistic and those which are reciprocal. In the case of antagonism or true parasitism when the host is killed the parasite also dies. In the case of true cooperation, the reciprocity is on a fifty-fifty basis. Some plants normally kill themselves by their own activities; the red mangrove builds an island on a muddy bank. As soon as this island reaches a certain heighth above the water the tree dies and is soon replaced by other kinds. We have two palmettoes which are sisters. One creeps along the ground dying at one end and growing on at the other. It is practically immortal. Its sister develops a vertical habit. She goes up till she can go no farther. Then she dies apparently killed by her own ambitions. In nature there are no fair practices acts. Natural law proceeds unhindered regardless of consequences. In business we may have cooperation as to price and competition as to service at the same time. Not so in nature.

Insects have developed to fit flowers and flowers to fit insects. Spines and acrid juices have developed in fruits to keep away browsing animals but when the fruit is mature it develops color, rich aroma and sweet juices to attract animals that will eat the fruits and

spread the seeds. The elephant can pull trees over, the giraffe can reach into the tender top foliage.

The strangest of all these combinations are the myrmecophyses or ant plants. A common example is the bullhorn acacia. Red ants live in its hollow thorns. It forms a safe home for this pest which bites like a coal of fire when it touches the skin of almost any animal. If there is the slightest shake these ants drop and sting with fiery fury. Some lands have been abandoned because of these pests working together in harmony. There are other ant-plants in the Tropics and in some cases the plant in return for services rendered feeds the ants with small pellets of food. In the case of ants milking aphids or plant-lice there is no benefit to the tree, in fact some trees are killed by these insects.

Among plants there is an interesting group called lichens. They grow on the bark of trees, on hard rocks and such places as fence rails and in both hot and cold places. These are a friendly combination of algae and fungi. This is apparently a case of 50-50 reciprocity. The reindeer moss which is dug out of the snow by reindeer is good pasture, producing milk, meat and hides for northern people. In the case of lichens one member produces something that the other needs and vice-versa.

It is of course true that the fittest survives but it may also be true that the ability to cooperate is one of the factors of fitness. It is true that vigor is a silvicultural quality which can be bred into trees by a process of selection if the tree can be quickly and easily propagated from cuttings. It is also true that the dominant trees of the forest are those which are produced by the best seeds.

Those who have too much will in time get soft and lose their niche in the world; those that have too little will struggle and in struggling sharpen their wits and come to the fore. Those who lose may in the end win. It is never wholly a battle of force but of know-how, which is a part of fitness.

On every hand there are evidences of working together in the insect world. Creatures with such modern equipment as insects possess, probably know what they are doing when they help one another. In plants conscious cooperation seems hardly possible yet it apparently exists. The honey bee wears out its wings and in consequence dies bringing in a lot more food than the colony needs especially in a tropical country. A honey bee usually dies when it leaves its stinger in an intruder while defending the colony to which it belongs. Now the common peanut which is a bean, flowers and fruits, when the flower is fertilized the stem quickly elongates and forcefully pushes the young bean into the ground where the beans mature. One wonders how it ever acquired such a remarkable habit.

The common violet flowers and it is a beautiful flower but it is not a flower at all. The real flower is very inconspicuous close to the ground. How and why did this curious camouflage develop?

Some orchids such as coralrhiza have fungous roots—and none of their own. When we bud or graft one thing on to another it seems like competition and cooperation in combination. The top and root work together but the stock in persistently sending up suckers appears to be struggling to get out of bondage. In the case of a graft it is two trees in one often referred to as asexual hybridation. If you bud or graft orange on orange or apple on apple as is often done to propagate special kinds the two merge perfectly.

Many things are on the way out and are called living fossils. Other things are on the way in and will survive if they fit in that special environment.

Years ago I read a series of little books on the plants of Java by a Dr. Schimper. His books were wonderful. They held you spell-bound but he concluded almost every chapter with the statement that further investigations were necessary before conclusions were warranted. My old professor in Mu-

nich would say that after fifty years of experimentation I am still in doubt. And so it will be a hundred, yes a thousand, years hence if man has not killed himself by his own inventions. When a great discovery is made it merely opens the door to many more mysteries beyond.

When they introduced dogs and pigs into the island of Mauritius the dodo was quickly doomed. Fitness therefore has to do with place and time. Nature knows no mercy. She indulges in trickery, camouflage, mimicry and many other traps to gain and hold a place. About the meanest of all are the birds that lay their eggs in other bird's nests. Birds however it seems to me are about the best equipped of all creatures. They get their food from the tree-tops; they move long distances under their own power and spend most of their time singing.

In the forest, which is a conglomeration of living things plant and animal, with the tree predominating, there our like in human society thrives, stranglers, dictators, learners etc. Some trees will not flourish without their buddies. One tree is so essential to the chocolate tree that they call it the "mother of the chocolate" and some even say that the chocolate grows best only in the sound of the native's voice. Some trees resent civilization; others seem to like the backyard of the native. Some, like the black walnut, dislike neighbors while others must have company. Some seem to have inferiority complexes and some are positively lazy.

Without both competition and cooperation there would probably be little progress although again we must carefully define the meaning of progress.

Anything however which is not fifty-fifty is no longer fully reciprocal and what is not reciprocal is not cooperative. In spite of all our investigations there will always be the statement of the searchers for the Truth "that further investigations are necessary before conclusions are warranted."

PAY DIRT TESTIMONIAL

December 11, 1946

Dear Mr. Rodale:

Through a friend of mine in U.S.A. I secured your book, Pay Dirt, which I have read with the utmost interest. My appreciation of your book may well be expressed in the words of my little son. Seeing me underlining certain sentences in red ink, he asked me why. "I am underlining statements, which I consider very important," I explained. "Well," he exclaimed, "judging from what I can see, you might as well dip your book in red ink."

Sincerely yours,

F. W. Patterson,
Vaekerqueien 196,
Rea-Oslo-Norway

•

A man asked me what would cure witchgrass, and I told him my rule was a strong dung-fork and a big backache.

Edward G. French

•

It is a strange thing, but once one is bitten with the "organic" bug he enters into the program wholeheartedly. My wife even shovels compost and rakes leaves in her dreams.

L. V. K.

Wheat for the Gardener

By DR. HOWARD G. LASKEY

MANY enthusiastic compost fans would like to raise a little wheat or rye for bread, instead of buying the poisonous trash that is supposed to be 'the staff of life'. It can be done without the use of machinery. We raise our own wheat with Bio-Dynamic Compost. The first year we raised 100 pounds, the next year 640 pounds. This year we shall raise 2000 pounds.

Average yield of wheat in the U. S. is 14.1 bushels, of 60 pounds per bushel, per acre. An acre is about 209 feet long and 209 feet wide. Therefore a small area, of say, 100 feet by 100 feet can produce over 400 pounds.

Sow spring wheat, in this area in April, or even early May, at the rate of 75 to 90 pounds of seed to the acre by broadcasting it. Rake it in about 1 inch deep and if possible roll the small area of seeding with a lawn roller. In early August it is ripe. Cut it with a sickle into convenient size bundles and tie each bundle with twine. Stand the bundles on the ground 'heads up'. Let it sun-ripen for a week or ten days. Then bring in the bundles, lay them on the side, up on boards off the ground, with the heads inside to dry and go through the 'sweat-stage'. If stacked outside, keep a piece of canvas handy to throw over the top, in event of rain.

When you need flour, get a tight wooden barrel. Open a bundle take a handful; hold the wheat in the barrel, heads down, and strike it against the sides of the barrel. The barrel will contain wheat and chaff. The straw is put into the compost pile.

To separate the wheat and chaff, place a clean canvas on the ground. Pick up a handful of the wheat and chaff, hold your hands at shoulder level. Slowly let the wheat trickle through your fingers on a day with a light wind. The seed being heavy will fall at your feet. The chaff will be blown away off the canvas. Now you have your wheat. Store it in a barrel with a tight cover to keep out pests. It may be shifted from one barrel to another, about once a week or less, and this physical action will deter many types of pests that attack stored grain.

To make flour it may be taken to a mill for grinding, or, you may buy a small grinding mill, or, if you wish, buy a druggist's mortar and pestle and pulverize the seed to flour for your weekly batch of bread making.

When you think of what you are getting, the occupation of making flour can be a pleasant one.

A fine cereal can be made by cracking the grain instead of grinding it to flour. Place the flour in a stone crock with a clean-washed stone in the center of the mass of flour to 'draw the heat', after the friction of grinding. We have kept compost grown wheat over two years in the cellar. It was in perfect condition when the last of it was used in baking.

French Gardening

By RICHARD HOPP
University of New Hampshire

HORTICULTURAL practices of one country cannot always be followed unchanged in another country. Even if climatic conditions may not be much different, there may exist economic reasons, preferences for certain crops, marketing conditions, labor costs, and so on which may prevent certain methods from being copied in one place although they have been found very effective elsewhere. Such practices, however, often may be adapted to local conditions without losing much of their efficiency.

The French market gardeners, and more specifically those supplying the Paris market, have for centuries practised a method of growing early produce intensively under glass. Beginnings of the system were described by Jean de la Quintinye (1626-1700), head of the famous gardens of Versailles, and apparently it was well established in the early part of the 18th century. Even now, in the immediate vicinity of Paris, particularly to the south and southwest of the city are located a great number of small holdings on which vegetables are raised entirely in hotbeds. Vegetable growing there is usually a family affair; holdings of one and one half to four or five acres support a large family who carry out a very intensive form of cultivation.

Adaptations of the system were slowly introduced into England and flourished there from time to time during the 19th and the early years of the 20th century. With the introduction of import duties on fresh vegetables in 1931, the cultivation of early vegetables under glass, coupled with the latest developments in soil heating and overhead irrigation, received a new strong impulse, and "French gardening" became a commercial proposition.

The term "French gardening" is used in England to describe the methods of intensive vegetable cultivation adapted from the French. In its strictest meaning, "French gardening" is a system requiring the use of hotbeds heated with manure. By following exact rules of intercropping and succession cropping as many as seven crops may be taken off a piece of land in one year. Several modifications of the system are practised, using semi-hotbeds and coldframes. In all cases—and this is probably the most interesting feature to readers of "Organic Gardening"—the outstanding characteristic is the medium in which crops are grown. In an established "French garden" there is no soil in the usual meaning of the word, the plants grow in a medium which is extremely rich in organic matter known as "terreau". For lack of a better expression we shall have to use this French term. Terreau is built up over a period of years by mixing the topsoil of the hotbed or semi-hotbed with the underlying manure, using this mixture as topsoil on the beds in the following year. As this gardening is carried out year after year on the same piece of ground it can be readily realized that after a few years a growing medium has been accumulated which can harly be described as soil. This terreau is a black, crumbly material consisting in its greatest part of broken down organic matter.

Whether the crops are grown on hotbeds or semi-hotbeds the plants are protected for part or the whole of their growing period by cloches or sashes which form characteristic features of the French intensive garden.

Cloches are made of thick glass and shaped like a bell, diameter at the base, 16¾ inches, height 14 inches. Cloches allow the maximum amount of light to reach the plants growing beneath them. The bell-like structure enables moisture that condenses on the inner surface to run down without dripping on the plants. To allow for ventilation it is in certain cases sufficent to make small openings by pressing down the soil at two points opposite each other where the rim of the cloche touches the ground. In comparatively recent years a modification known as continuous cloches has become very popular. They are made either of two panes of glass held in position by wire to form an inverted V, or of four panes thereby adding sides beneath the inverted V. These cloches have recently been described in detail in the "Market Growers Journal", June 1946.

The sashes used by French gardeners to cover hotbeds are usually 4 ft. by 4 ft. 5 in. In Holland a type of sash has been developed which consists of a single piece of glass in a light wooden framework. The panes measure 32 by 58 inches (80 cm by 150 cm). These "Dutch lights" are considerably lighter than the conventional sashes and can easily be handled by one man. The single sheet of glass admits more light to the growing plants, and dripping is eliminated. Dutch lights are now widely in use in England wherever early crops under glass are grown commercially on a large scale.

Working on problems of intensive vegetable cultivation at the University of Reading, England, the writer visited a great number of commercial enterprises in the late 1930's where "French gardening" was practised, some of the gardens covering several acres in conjunction with vegetable farms of several hundred acres, equipped with easily moved small gauge railways for transporting manure, sashes, cloches, etc.

How is a "French garden" established, and what crops are grown? It may be best to follow through a year's work in a typical adaptation of this system. It has to be borne in mind that "French gardening" as described here is carried out in climates where severe frosts occur only very rarely and where the ground usually does not freeze to such an extent as to interfere with gardening operations.

During October or November the top layer of the whole plot is thrown up in ridges thereby mixing the manure, laid down in the frames the previous spring, and the topsoil. The ridges run north and south with sufficient room for a truck to pass between them. During November and December the ridges are turned three or four times to insure thorough mixing and weathering. With each turning the soil is moved to the north so that after the last turning the site for the first range of frames is cleared. The area for those is now dug over and a layer of long strawy manure accumulated during the previous months put down, about nine inches thick. A simple wooden structure to support the sashes consisting of 9 x 1 inch boards for the back and 2 x 4's for the front is placed in position and filled with an even layer of terreau from the ridges. As the first range is filled, the site for the second range is automatically cleared, and so on. A pathway of 12 to 15 inches is left between the ranges of frames. The soil is then firmed and raked and the beds are ready for planting. Preparation of the beds is so timed that planting can start in the second half of January.

The first three crops to be planted are carrots, lettuce and radish which are to grow simultaneously. *Carrots* are broadcast thinly so that the seeds come about one inch apart. Especially suited forcing varieties are used such as Amsterdam Forcing or Inimitable Forcing. The seed is lightly raked in, usually with a sharp pronged fork and the terreau pressed down lightly. *Lettuce* plants are now set out, alternating three and four rows of six plants under each Dutch light.

Fig. 1

Fig. 2

Fig. 3

This gives an approximate planting distance of nine inches square to avoid having any plants set directly underneath the joints of two sashes. The lettuce plants are raised in a greenhouse, in frames or under cloches from seed sown about the middle of October. Again particularly suited varieties are used, such as the French Gotte a forcer or Chestnut Early Ball, the latter developed by the Chestnut Experiment Station, England, for this purpose. These are varieties of the butterhead type, since a compact growing lettuce is essential in this system. Between the lettuce plants and between the rows of lettuce, *radishes* (French Breakfast Forcing) are sown, usually by placing two or three seeds in holes four and one half inches apart. In practice the holes are made with a suitable marker and planting of lettuce and radish seed carried out simultaneously. The Dutch lights are now put on and remain shut until the radishes are pulled. Should weeding become necessary, this is done on a still and bright day. During the whole period while radishes and lettuces are growing under the Dutch lights, no water is given. The terreau, having a very high water holding capacity, should have taken up sufficient moisture from the autumn and early winter rainfall while ridged up to carry both crops to maturity. The alley ways between the ranges of frames are filled with long strawy manure which is also placed along the four sides of the plot. This prevents the soil between the frames from drying out and assists in keeping frost out of the beds.

The accompanying illustrations show the various stages of preparing the beds. Fig. 1: terreau put up in ridges; fig. 2: frames filled with manure and partly filled with terreau; fig. 3: frame ready for planting; figs. 4 and 5 completed plot, manure placed in pathways and around the plot; fig. 6: marker used for planting lettuce and radishes. The consistency of the terreau can easily be seen in fig. 6. (Photographs taken at Horticultural

Farm, University of Reading, Reading, England, 1937-1938).

The radishes are ready to pull within six to seven weeks after sowing, and lettuces ready to cut during the second half of March.

At the time the lettuces are ready to cut the beds are interplanted with *cauliflower* plants—usually five plants under each sash—raised during the winter in coldframes. The growing of these plants may present some difficulties to the beginner; the aim is to produce well grown plants for planting out which have been kept growing slowly and steadily all the time. Plants which receive a check at any time of their growth will usually not form proper heads.

As the growing crops require greater headroom the entire frames are lifted, a few inches at a time, by placing blocks of wood or bricks underneath them.

The carrots generally remain small while the lettuces are still in the frames but grow away quickly after the lettuces are cut and the beds watered. Carrots should be ready to pull by the end of April or early May; cauliflowers are ready in June. Several varieties are often grown to provide a succession in maturity. Dutch growers have developed especially suited varieties for this purpose.

As soon as the cauliflowers are finished and the beds are clear, a second cropping program can be started. By this time the sashes are not required any longer. The frames are taken down, the beds lightly dug over—deep digging would bring the manure to the top. The long strawy manure used in the alley-ways may be dug in at this time, thus adding more organic matter to the terreau and keeping it in a constant state of high fertility. On larger areas this can be done by shallow disking.

When the cauliflowers have been cut, four crops have been taken off the plot during the first half of the season. The beds are now immediately planted with a self-blanching variety of *celery* and *lettuce* (Glory of Nantes).

Fig 4

Fig. 5

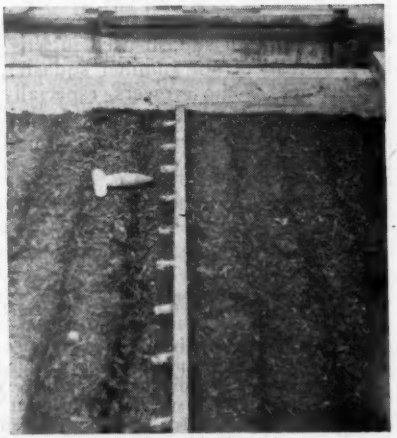


Fig. 6

The celery is planted 10 inches apart in rows 12 inches apart and the lettuce also at 10 inches apart set between the celery rows. The raising of both celery and lettuce seedlings has to be timed perfectly so as to have plants of the right size and age available at the time of planting out.

The lettuce crop should be ready to cut during the last week of July, about a month after setting out the plants. Owing to the close planting, the celery plants afford each other sufficient shade for blanching; some kind of protection from light may be necessary around the outside of the plot. A common practice in French gardens is to cover the celery with a layer of straw two or three days before cutting in order to insure even blanching. Celery should be ready for market at the end of August or early September. Depending on the season the beds are occasionally replanted with lettuce as soon as the celery is cut to mature before the onset of frosty nights, thus giving six or seven crops from one ground during the season.

This outline of a year's work in a "French garden" may be sufficient to give a general idea of its possibilities. Many modifications of this system are, of course, in use to suit particular preferences or market demands. A number of different crops fit into the cropping program, such as turnips, marrows (a type of squash used in England instead of our summer squash), melons etc. Some growers, especially those whose soil has not yet reached a high state of fertility, have found early gladioli to be a suitable second crop. Planted in early March between a half grown lettuce crop, the flowers are cut in June and July, again allowing for a second cropping program. Lack of space prevents going into details of other variations of the system.

It is obvious that under the method of "French gardening" where almost every square inch of the ground is utilized to the fullest extent throughout the season the growing crops would require more plant nutrients and water than a single crop on the same area. The terreau provides all the necessary plant nutrients. The use of chemical fertilizers in "French gardens" is not common practice. As to water, an adequate water supply, best in the form of overhead irrigation, is essential.

The success of "French gardening" depends largely on the skill and judgment of the operator especially at times when constant attention to ventilation is required, but he has the advantage over the ordinary gardener insofar as he has a highly fertile growing medium extremely rich in organic matter at his disposal without which such intensive cultivation would not be possible. Because of shortages of manure, particularly of horse manure which is preferred for this system, mixtures of manure and leaves, manure and straw etc. have been used with advantage. Alternative methods of soil heating using hot water pipes or electric heating cables have not been very successful since they do not supply the soil with much needed humus, the essential feature of this method of intensive cultivation.

Hemps Wants Organics Too

HEMP is one of the plants that succeeds well only in rich soils. The retting process required for fiber production demands also special climatic conditions. During the war, hemp was grown farther West with lesser success. Fields that were low in organics produced the poorest yields. While good plants reach eight feet in height, fields which had not been manured for long periods produced plants of only 2-3 feet. according to a report published in the *Journal of the American Society of Agronomy*, December 1946.

Ancestral Organic Gardening

By ARTHUR E. HUTCHINSON

CAREFULLY perusing copies of your "Organic Gardening" has, I assure you, occasioned me very much interest and pleasure. Not that the subject is new to me. Not at all. One of my earliest boyhood recollections is of my father and his two helpers (hired men they were called in those days) going to a miry swamp, in the usually dry season during August—after the hay crop was harvested—and digging from this deep, marshy tract loads upon loads of so-called "muck". Black, heavy, slippery stuff it was.

For motive power, to get this material to high, dry land, well trained oxen (steers) were used. Oxen could sink down in the mire nearly to their bellies and keep on moving where if horses had been used they could not have sunk to this depth and extricated themselves without outside aid. Even now I can look back some sixty five years, to those faithful, plodding oxen. True they were slow. Perhaps you would be if all you received for your herculean efforts were food, shelter and a little "rubbing down" once in a while. They were trained to obey the motions of a driver's stick and so well did some of these oxen respond that it was possible to direct them, with their load, within two inches of where the dumping was planned. I know for I have often done this. The words they understood were few, usually such as "Come on boys", "haw", "gee" and "back". While once in a while there would be an unruly fellow, I have thought if some of our working folks were half as dependable as those willing, toiling oxen they would be more faithful to the trusts committed to their charge.

The men, for this work, wore high leather boots. Rubber boots, made as they were in those days, could not be depended upon to stay with a man, when partly submerged in the mire. In drawing his foot out he would occasionally part with his boot, and the result would be uncomfortable, and his remarks sometimes inelegant. Leather boots were much harder to dislodge. They were made impervious to water by liberal applications of neatsfoot oil, or sometimes by a mixture of beef tallow and woodchuck oil.

The muck was gathered in what was called scoop shovels, and slid up to the higher ground, where it was left for a time to drain and dry out. It was then strewn in the pens and stables and pig sties. As a small boy I remember my father stating that there was not only value in the muck itself, but that it was a very important factor in holding the valuable liquid excrements of the stock, which otherwise would flow away and be wasted. While this procedure seemed rather of a hard method of increasing soil fertility, the only regret I ever heard my father express, in relation to it, was that he never seemed able to find time to prepare enough of this material.

Also in the late Summer father and his men would go to the pasture swamps and cut many tons of coarse, rank grass and dry it thoroughly. This grass was not considered good enough in quality to feed dairy cattle, but the growing stock would eat some of it, and what was left was used for the protection and comfort of the various animals, later, when soiled, to be added to the huge amount of other materials to decay, as they called it in those days, which today is about the same as composting.

In these pasture swamps hornets often had their homes and quite often a man would be stung. Hornets are very quick and sly. Unlike bees and wasps you cannot always see them, but you certainly can feel them. The

men didn't like this very well, but father used to tell them not to mind, as they were only there to accelerate locomotion. Father was a hustler in his work and he liked to have his men on the move. For some reason the hornets didn't seem to trouble him. There are people who can handle bees with almost no protection while others need to be fully covered.

There were three large orchards on the farm. When the trees were trimmed or pruned, the limbs were burned and the ashes carefully saved, as were also the ashes from some twenty cords of hard wood used as fuel each year, all of which came from the farm, no other fuel being used.

Some of the neighboring farmers I am inclined to think, considered father rather radical in his methods. He would not sell the whole milk from the farm. He seemed to think it wrong. He said some of this product ought to go back to enrich the land. "For the lands sake be good to it" he would say. For a great many years butter was made on the farm and sold, then, as the dairy increased, the cream was sold and the skim milk went to feed calves, pigs and chickens, that would replenish the older stock after they had passed the stage of usefulness for which they were intended, and usually to add a few more each year to increase production. Every bit of refuse from the tons of beef, pork and poultry that were sold was carefully garnered and added to the compost for next years' profit. A great deal of this combined composted material was drawn to the field in the Winter time, and again stacked. It could not all be done at planting and sowing time. There was too much of it, and to spread it on top of the ground, to lie there for weeks, as some of the neighbors did, was not to be thought of. Too much of the goodness would wash away as we were told. Every ounce must be saved.

Naturally by this time you are asking: What was the result of all this labor? Father bought this farm four or five years before the writer was born, so for the first dozen years I am unable to state facts from observation. When I remember the business set-up, at seven or eight years of age, there were some thirty head of cattle, three horses, three or four swine, about 150 hens and some twenty sheep. Twenty five years later stern duty called me to another state. At that time there were sixty head of cattle, four horses, about fifteen swine, breeders and fattening shoats, six hundred or more laying hens, and some forty sheep. The larger part of the grain was raised on the farm, although wheat by-products were bought in considerable quantities, to give a balanced ration in feeding. Also some special poultry and dairy feeds were used. It was father's desire to raise a thousand bushels of corn a year. He accomplished his ambition. Corn was his outstanding crop, and on which he had a widespread reputation. At husking time seed was selected for the following year. At first there were not too many two eared stalks, but when possible, all seed was taken from stalks having two ears. As the years came and went the two eared stalks increased, until the time when the majority of the stalks had two ears each, but so particular was he in his selection that usually only one of the ears passed the test, though the other might be equally as large. Perhaps this is the reason, later on, that the writer had the honor of winning the first prize on corn, at a large County Fair, three years in succession, in strong competition. Corn was the only cereal raised that was sold, and then only for seed purposes. About three hundred bushels of oats were raised each year, also fifty to seventy five bushels of buckwheat and about as much rye. Huge quantities of garden vegetables were raised and what was not needed for home consumption found a ready market, together with the butter and eggs, to a private trade, in a nearby city.

This trade was continued through parts of three generations, for over fifty years, one customer telling the writer she had been buying of this

family for over twenty five years, and in only one single instance had she found an unsatisfactory article. Father, for some reason, resented the term of peddler. He took pride in stating that everything was sold to his trade, before he left his home, which was substantially true.

While many families depended on supplies from this large farm the home table was never neglected. Men and women who worked twelve hours a day, on the average, needed good, substantial food and in this case at least, they had it, even though at many meals nearly everything on the table was home grown. There was a first class flouring mill, not far away, and a miller who knew how to operate it. Rye, buckwheat and corn were converted to culinary use. While many pounds of wheat flour were purchased, rye flour for bread was used even more. Rye shortcake also had its place. Buckwheat griddle cakes, with home made maple syrup, and sometimes a sausage or two with same, together with home made raised doughnuts and coffee, for each worker, were often on the breakfast menu. You see both men and women usually worked two to three hours before breakfast and they were hungry, some making this meal the most important one of the day. Corn meal was used in a variety of ways; Brown bread, both steamed and baked, flap jacks and johnny cake, and oh! such hominy as our miller knew how to make. Yum yum. Mr. Editor it doesn't seem as though I could go on. I'm so hungry. Somehow today this food, by the same name, does not seem to taste as it did in those days of yore.

Of course there was plenty of beef and pork, fowl and chicken and some lamb and mutton. Yes we also had fish, not only from the market, but sometimes on cloudy days and early evenings, the boys would hie away to the streams and ponds and often catch enough fish to give the family, and sometimes the neighbors, all they wanted, for as long a time as they could be kept edible. I'm sure the boys, in those days, did not know they were destroying tillers of the soil when they could go out anywhere, on the better arable land and, in a very few minutes, dig plenty of earthworkers for the hungry fish. Brook trout, pickerel, bass, perch, roach and eels. The last named were not regarded favorably by some, especially the women folks. Thought they looked too much like black snakes. Well! They didn't have to eat eels, or anything else they did not care for. There were usually seven or eight in the family, sometimes nine, and never, in one single instance was there the slightest lack of good, substantial food at meal time, to the very best of my remembrance and belief. Some years there were two to three hundred bushels of apples. Other years not as many. What fun the young people had with their apples and nuts all grown on the farm, cakes, which the girls would bake, home made candies galore. No sugar or molasses shortage in those days. Perhaps previous to the above there had been a sleigh ride, a coasting or skating party. Innocent sports, which the young folks, and some of the older ones too, so much enjoyed.

It seems my bounden duty, before closing this article, to give most deserving credit to at least two people who contributed a very important part to the success of the undertaking I have attempted to describe. My mother, who is now living in her ninety ninth year, and my older sister, who has gone to her reward. Both were exceedingly faithful in co-operating toward the aims and ideals my father envisioned.

My ancestors, on both sides, were so-called sons and daughters of the soil, and all of them, as far back as my knowledge goes, lived to be eighty or more years of age.

From what I have been able to learn it seems certain, that while perhaps they did not follow it to the extent my father did, all of them adopted, to a greater or less degree, the principles of what is now known as "Organic Gardening".

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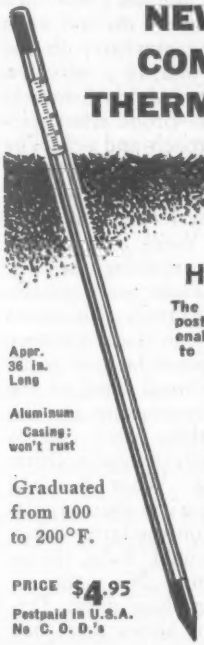

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A FLORA OF SOUTH CENTRAL STATES, by R. G. Reeves and D. C. Bain. Published by W. M. Welch Manufacturing Company, Chicago, Ill.

The principle aim of this semi-technical work is to provide a textbook for an elementary course in plant taxonomy and a manual for the identification of seed plants in general of South Central Texas. The publication includes both domestic and wild plants and is printed in language not so technical as to discourage its use by persons other than professional taxonomists.

Margaret O. Goldsmith, THE PICTURE PRIMER OF INDOOR GARDENING. Illustrated by Harrie Wood (Houghton Mifflin Company, 2 Park Street, Boston. $2.00)

A very handsome and instructive booklet that is a joy to handle. It makes a nice birthday gift to a flower lover. Even the expert will enjoy reading it and checking his own experiences with the recommendations of the author. A careful system of cross references makes the book even more useful. While the uncounted color illustrations are not exactly done in botanical detail, they are charming and helpful.

Swann Harding, TWO BLADES OF GRASS. A History of Scientific Development in the U. S. Department of Agriculture. (Univ. of Oklahoma Press, Norman, Oklahoma. $3.50)

Among the most interesting men in the Department of Agriculture is Mr. Harding who has given some time to the study of the Department's history. In this book, he shows how the history of scientific agriculture became to a considerable degree the history of agriculture. It cost about $65,000 to make the basic discoveries in the fight against cattle-tick fever. That work has been worth $40,000,000 a year. He shows how a highly technical paper on mould growth meant the discovery of trace elements and allowed fruit growers to keep up production after the soils started getting depleted. The real value of the book is to my mind the author's intimate acquaintance with people; he started in the Department in 1910 and, being a fine genial writer, is able to recapture the picture of the leaders in a few sentences. This makes out of the relatively dry subject of scientific history an absorbing account that an intelligent reader will relish as much as Mr. Conant's recent lectures. How effective the literature is appears from such statements as this: One

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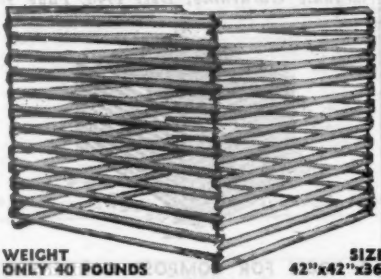

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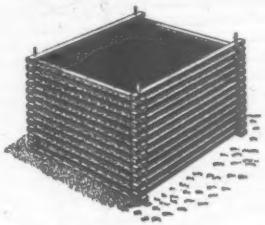

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on poultry lice control went into an edition of one and one quarter million copies. We are sure that, when organic research once gets under way, and when thereby a permanent and stable agriculture can be established instead of the doctored system of the business age, the Department of Agriculture will have crowned its many previous successes with the final answer. Mr. Harding does not give criticism, but a history of what has been done, and the record is quite overwhelming. You might almost believe that there is some progress after all.

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This book by an expert shows the personal approach in everything; it is not one of the wishy-washy bits of garden writing that appear so often in magazines, papers and books. It is solid, thorough, based on decades of experience; it is suggestive to the expert and helpful to the novice. Nothing better for Coast conditions and their special problems! We can fully endorse it and suggest that gardeners in the South and in other parts of the country also look into this book. They will find it helpful in many ways, they too can enrich their gardening by following Mr. Mitchell's solid advice. Very highly recommended.

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This book advises the home owner concerning the various types of land and the most successful way that each may be planted. In addition it tells how to make a lawn and care for it . . . planting plan so as to eliminate costly errors of placing trees, shrubs and flowers. There are also numerous suggestions for planting formal, informal, sunken and wild gardens. Finally a plan for kitchen gardens, herb gardens and service areas gives valuable hints as to the proper placing of screen material to shut out undesirable views.
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Emmaus, Pa.

EUCALYPTUS LEAVES

Q. We have on our new Rancho quite a Eucalyptus grove. I do not recall having seen any comments in Organic Gardening on the use of the leaves of such trees as a mulch, or for use in compost. Could the leaves and the thin layers of bark be used in compost?

W. H. R., Napa, California.

A. The leaves and bark of Eucalyptus contain Oil of Eucalyptus which makes it undesirable to use them directly as a mulch. Before composting, they should be exposed to the weather until most of the oil has disappeared. Then the leaves and bark can be used in the compost heap the same as other leaves.

—o—

SLUGS

Q. I have enjoyed your magazine *Organic Gardening* so much. Now I am writing to ask for any information you can give me on slugs. This has been a very damp year and my garden is full of them. What damage do they do? I have not actually seen any except to strawberries.

J. A. S., Irvington, N. Y.

A. At least two species of slugs may become troublesome in the garden. The more common one is the gray field slug; the other is the giant or spotted garden slug. Slugs hide under rubbish during the day and feed at night on tender leaves of many garden plants, leaving a slimy trail where they have crawled. Jelly-like eggs are laid in the fall and spring in the soil or under stones, sticks, and clods of earth. Slugs may be trapped beneath shingles or pieces of board and then

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killed. Plants may be protected by sprinkling hydrated lime or air slacked lime or wood ashes on the soil, as slugs and snails do not willingly crawl through dry materials.

Proper garden sanitation, as removing all rubbish and plant materials to the compost pile, will help in the control of slugs. Do not use poisonous chemicals.

—o—

OAK LEAVES

Q. I have one of your *Organic Gardening* magazines that was sent to me a few days ago. I am very much interested in the Howard Process of making compost. We live in the "heart of the forest" with practically nothing but oak trees. I have been told that oak leaves are sour and unsuitable for making compost. I would like your advice.

Mrs. J. C., Baldwin, Michigan.

A. Leaves of all kinds are rich in minerals, having approximately twice as much as manure. Oak leaves contain as much nitrogen, 0.8 percent, as dry manure. Dried leaves have an acid reaction. This makes leaf mold especially valuable for acid-loving plants such as rhododendrons, azaleas, camellias, begonias, fuchsias, roses, and wild flowers of the forest.

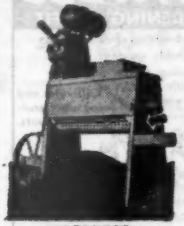
Incorporate the oak leaves in the compost heap with such other plant materials as weeds, garden plants from which the crops have been harvested, and lawn clippings in such a way that the leaves do not form a compact layer in the heap. By adding to each layer of the compost heap a sprinkling of pulverized limestone, the acids will be neutralized.

—o—

CHRYSANTHEMUMS

Q. I think your Organic Gardening Magazine is fine. We read it from cover to cover. Some day I hope to find something in it about Chrysanthemums. That's one flower I love. Can we put compost on top the soil

For BETTER
COMPOST



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around the plants this fall or should it be spaded into the soil?

W. C. F., Illinois.

A. To get the best results, Chrysanthemums should be taken up, divided, and reset each year. Because they are heavy feeders, the preparation of the soil should include a most liberal application of compost. Most Chrysanthemums are inclined to grow tall and slender, but this can be avoided by pinching out the top of the plant as soon as it is about 6 inches tall. This will cause branching. Then, in the middle of July, each of these branches should be cut back so that they in turn will give rise to branches. To get large heads, all but the terminal head of each branch should be pinched out. As the plants grow, they should be carefully supported with stakes. During the growing season, give the plants additional applications of compost. Plants of the late varieties should be dug in September and transplanted into flower tubs or large flower pots and brought indoors. Plants so treated often are in full bloom for Thanksgiving.

—o—

BLACK ROT OF GRAPES

Q. For several years I have used (not too successfully) spray for black rot of grape, but since reading Organic Gardening I would like to overcome this trouble without the use of sprays. Please advise me.

C. C. P., Martinsville, Ind.

A. You may be interested to know that grapes grown in India and China where chemical fertilizers and poisonous sprays have never been used and where the soil is fertilized with well rotted manures and compost, are completely free from all diseases. There is no reason why the same thing can not be done in Indiana.

The black rot of grape is the most destructive fungous disease of grape which not only destroys the fruits but

spots the leaves. The fungus winters over on the mummified, dry fruits. The first control measure is to carefully remove all diseased fruits and destroy them. Then put a heavy application of properly made compost around each plant and work it into the soil. It will probably require a year or more to restore the vines to sufficient vigor to enable them to resist fungous diseases. Do not use poisonous sprays of any kind.

—o—

NEMATODES (EEL WORMS)

Q. My garden is infested with nematodes. Will the continuous use of compost eliminate them or would you recommend treating with D.D.T.?

Dr. C. M. F., Florida

A. The presence of nematodes indicates that something is radically wrong with your soil. The best and quickest method of eliminating the nematodes is to work into the soil liberal applications of properly made compost. The compost in the soil will make possible a rapid increase in the soil bacteria and soil fungi which are antagonistic to the nematodes. Sir Albert Howard has described a case where nematodes were killed out as a result of the application of humus. Many of our readers have had the same experience. No chemicals should be used as they will kill the soil organisms and thus delay or prevent the elimination of the nematodes.

NOTICE TO READERS

The ORGANIC GARDENING Magazine does not accept advertising of chemical fertilizers or other fertilizers which we feel are too strong for the land or poisonous sprays. We do not deny firms access to our advertising columns if they handle chemical fertilizers if they have another acceptable product to sell. The reader should be careful in accepting such advertisements. Our responsibility extends only to the product advertised in our magazine. It does not extend to all of the products handled by a concern

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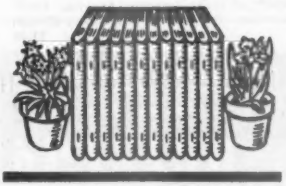

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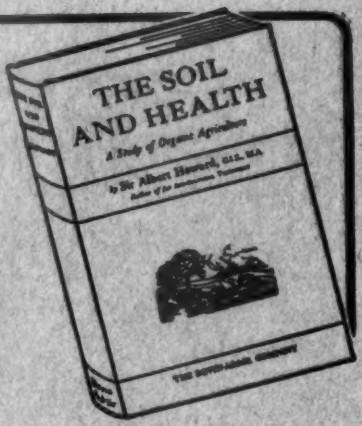

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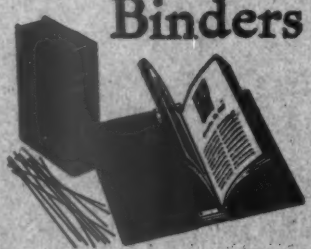

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